```
--------------------------------------------------------
                    IES   B007   001
 IPCONS-LIST+NLIST1
          **INSTANCE - POINT
  C1→     NCONGENSP≡(CN10-NLIST+1,,CONSTRAINTS+SPECB+1-
                                  LIST)-
               ,(35,22,,37,50),(16,16,,0),43,1,2,2
          **THING ON LINE
  C2→     NCONGENSP≡(CONSTRAINTS+SPECB+1-LIST,,#-NLIST+
                                  MASBL),-
               (35,30,,33,38),(16,16,,0),33,2,1,3
          **THING ON CIRCLE
  C3→     NCONGEN≡(41,31,,22,36),(16,16,,0),22,3,1,3
          **VERTICAL THING
  C4→     NCONGEN≡(41,45,,21,30),(14,12,,0),24,4,1,1
          **HORIZ OR VERT LINE
  C5→     NCONGEN≡(42,45,,36,27),(16,14,,0),27,5,1,2
          **THING PARALLEL TO LINE
  C6→     NCONGEN≡(33,43,,37,43),(16,16,,0),30,7,1,3
          **MULTIPLE DISTANCE
  C7→     NCONGEN≡(42,30,,23,34),(22,20,,0),34,10,1,4
          **MULTIPLE SIZE
  C8→     NCONGEN≡(24,51,,30,42),(16,14,,0),42,11,1,2
          **SCALER = DISTANCE
  C9→     NCONGEN≡(30,23,,24,42),(16,16,,0),23,12,1,3
          **SCALER = SIZE
  C10→    NCONGEN≡(30,42,,24,42),(14,14,,0),21,13,1,2
          **FULL SIZE INSTANCE
  C11→    NCONGEN≡(33,33,,44,25),(12,12,,0),25,14,1,1
          **MID POINT
  C12→    NCONGEN≡(37,23,,30,34),(16,16,,0),47,20,2,3
          **6FOLD SIZE CONTROL
  C13→    NCONGEN≡(22,42,,25,6),(14,12,,0),6,21,1,1
          **POINTS NEXT NUMBER
  C14→    NCONGEN≡(35,35,,20,37),(16,14,,0),36,23,2,2
          **HOLD LENGTH
  C15→    NCONGEN≡(23,23,,36,27),(16,14,,0),46,24,1,2
          ** # = FORCE
  C16→    NCONGEN≡(24,22,,41,25),(20,16,,0),50,25,1,1
          **PARPLLEL LINES
 CN10→    NCONGENSP≡(#-NLIST-MASBL,,C1-NLIST+1),-
               (37,41,,36,37),(22,20,,0),37,8,1,4
CNLAST→ 0
 CCFR-301
CCFR30→ 0
        0
        0        26
       #JMP   FORCE
       #JMP   HOLDL
       #JMP   PNNU1
       #JMP   PNNU2
       #JMP   #FSC
```

IES B007 002

```
CCFR20→ *JMP   MIOP1
        *JMP   MIOP2
DEGEN1→ 'STE   *+1
        JPQ    *
CCFR14→ *JMP   IBFSCOMP
        *JMP   SIZECOMP
        *JMP   DISTCOMP
        *JMP   MSCOMP
CCFR10→ *JMP   MDISCOMP
        *JMP   TPTLCOMP
        *JMP   PRLCOMP
        *JMP   HOVSCOMP
        *JMP   IBVERTCOMP
        *JMP   ONCIRCCOMP
CCFR2→  *JMP   ONLINECOMP
 ORIGIN1
STARTS→ 0
HEADING1→
        'STE   HEADING1X
        DPX  0  SAVE0
        VDIFF≡ε→δ=DELTA2→BADOV
        JPQ   HEADING2A
HEADING2→
        'STE   HEADING1X
        DPX  0  SAVE0
HEADING2A→
        VDIFF≡γ→β=DELTA1→BADOV
        RSX  0  SAVE0
HEADING1X→
        JPQ  *
PARAERR→
        'STE   PARAERRX
        PROD≡DELTA1*DELTA2+1/DIST=TS→BADOV
        PROD≡DELTA1+1*DELTA2/DIST→BADOV
        DIFF→TS→BADOV
PARAERRX→
        JPQ  *
PPDERR→ 'STE   PPDERRX
        PROD≡DELTA1*DELTA2/DIST=TS→BADOV
        PROD≡DELTA1+1*DELTA2+1/DIST→BADOV
        SUMM→TS→BADOV
PPDERRX→
        JPQ  *
PRLCOMP→
        'STE   PRLCOMPEX
        SETIX≡β,γ,δ,ε
        *JPQ   HEADING1
        PYTH≡DELTA1=DIST→BADOV
        PYTH≡DELTA2→→BADOV
        SUMM→DIST=DIST→BADOV
```

```
------------------------------------------------------------------
              IES  B007  003
        EITHER≡PPDERR,PARAERR→20
PRLCOMPEX→
        JPQ  *
MDISCOMP→
        'STE  MDISCOMPX
        SETIX≡β,γ,δ,ε
        *JPQ  HEADING1
        PYTH≡DELTA1=TS→BADOV
        PYTH≡DELTA2=TT→BADOV
        EITHER≡MD1,MD2,MD3,MD4,MD5→20
MDISCOMPX→
        JPQ  *
MD1→    'STE  MDX
        LDA  {-(β)}
        JPQ  MDT
MD2→    'STE  MDX
        LDA  { 200,}
        JPQ  MDT
MD3→    'STE  MDX
        LDA  {1-(β))/3}
MDT→    MUL  TS
        SUB  TT
        SCA  {-1,}
MDX→    JPQ  *
MD4→    'STE  MDX1
        LDA  { 200,}
        JPQ  MDT1
MD5→    'STE  MDX1
        LDA  {1-(β))/3}
MDT1→   MUL  TT
        SUB  TS
        SCA  {-1,}
MDX1→   JPQ  *
MSCOMP→'STE  MSCOMPX
        SETIX≡β,γ
        RSX  SIβ  LIST+TYPE
        AUX  βIS  LIST+VARLOC
        RSX  SIγ  LIST+TYPE
        AUX  γIS  LIST+VARLOC
        PYTH≡LISTβ=TS→BADOV
        PYTH≡LIST =TT→BADOV
        EITHER≡M 1,MD2,MD3,MD4,MD5→14
MSCOMPX→
        JPQ  *
TPTLCOMP→
        'STE  TPTLCOMPX
        SETIX≡δ,β,γ
        *JPQ  HEADING2
        PYTH≡DELTA1=TS→BADOV
        GETVAL≡0,1*δ→DELTA2
```

```
------------------------------------------------
                IES   B007   004
        COM   DELTA2+1
        *JPQ   PYTHAGORIAN
        *JOV   BADOV
        SUMM→TS=DIST→BADOV
        *JPQ   PARAERR
  TPTLCOMPX→
        JPQ  #
  ONLINECOMP→
        'STE   ONLNX
        SET IX≡β,Δ,γ
        REX  ε|γ
        *JPQ   HEADING1
        PYTH≡DELTA1 =DIST→BADOV
        PYTH≡DELTA2→→BADOV
        SUMM→DIST=DIST→BADOV
        REX  γ|Δ
        *JPQ   HEADING2
        PYTH≡DELTA1→→BADOV
        SUMM→DIST=DIST→BADOV
        *JPQ   PARAERR
  ONLNX→  JPQ  #
  ONCIRCCOMP→
        'STE   ONCIX
        SET IX≡β,γ,Δ
        DISTANCE≡β→γ=TS→BADOV
        DISTANCE≡β→Δ→BADOV
        SUB   TS
        SCA  (-1,)
  ONCIX→  JPQ  #
  HOVSCOMP→
        'STE   HOVSX
        SET IX≡β,γ
        *JPQ   HEADING2
        EITHER≡HOVSCOMP1,HOVSCOMP2→14
  HOVSX→  JPQ  #
  HOVSCOMP1→
        SUBR≡LDA   DELTA1
  HOVSCOMP2→
        SUBR≡LDA   [illegible]TA1+1
  IBVERTCOMP→
        'STE   IBCOMPX
        SET IX≡β
        GETVAL≡0,1*β→DELTA1
        EITHER≡HOVSCOMP1,HOVSCOMP2→12
  IBCOMPX→
        JPQ  #
  DISTCOMP→
        'STE   DISTCOMPX
        SET IX≡Δ,β,γ
```

```
-----------------------------------------------
                IES  B007  005
        PYTH≡DELTA1→→BADOV
        SUB δ LIST+SVAL
        *JOV  BADOV
DISTCOMPX→
        JPQ *
SIZECOMP→
        'STE  SIZECX
        SET IX≡β,γ
        GETVAL≡0,1×β
        *JPQ  PYTHAGORIAN
        *JOV  BADOV
        SUB γ LIST+SVAL
        *JOV  BADOV
SIZECX→JPQ *
IBFSCOMP→
        'STE  IBVSCOMPX
        SET IX≡β
        PYTH≡IVAL+LISTβ→→BADOV
        RSX α|β LIST+IWHAT
        DIFF→PSIZE+LISTα→BADOV
IBVSCOMPX→
        JPQ *
MIDP1→  'STE  MIDP1X
        *JPQ  3SET
        LDA  DELTA2
        ADD  DELTA3
        SCA  (-1,)
        SUB  DELTA1
        *JOV  BADOV
MIDP1X→JPQ *
MIDP2→  'STE  MIDP2X
        *JPQ  3SET
        LDA  DELTA2+1
        ADD  DELTA3+1
        SCA  (-1,)
        SUB  DELTA1+1
        *JOV  BADOV
MIDP2X→JPQ *
3SET→   'ST[illegible]  3SETX
        [illegible]X≡β,γ,δ
        DPX α SAVEα
        WHEREIS≡β→DELTA1
        WHEREIS≡γ→DELTA2
        WHEREIS≡δ→DELTA3
        RSX α SAVEα
3SETX→  JPQ *
6FSC→   'STE  6FSCX
        SET IX≡β
        GETVAL≡0,1×β
        *JPQ  PYTHAGORIAN
```

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```
--------------------------------------------------------
                IES   B007   006
        #JOV  BADOV ,
        STA   TS
        EITHER≡32S,16S,8S,4S,2S,1S→12
#FSCX→  JPQ #
32S→    'STE   32SX
        LDA ( INCH/32.)
        JPQ   32ST
16S→    'STE   32SX
        LDA ( INCH/16.)
        JPQ   32ST
8S→     'STE   32SX
        LDA ( INCH/8.)
        JPQ   32ST
4S→     'STE   32SX
        LDA ( INCH/4)
        JPQ   32ST
2S→     'STE   32SX
        LDA ( INCH/2)
        JPQ   32ST
1S→     'STE   32SX
        LDA ( INCH)
32ST→   SUB   TS
        #JOV  BADOV
32SX→   JPQ #
PNNU1→  'STE   PNNU1X
        SET IX≡8,Y
        #JPQ  HEADING2
        #JPQ  PNNUGET
PNNUT→  PROD≡DELTA1*(NUMRAT)=DELTA1
        EITHER≡PNNUT1,PNNUT2→14
PNNU1X→ JPQ #
PNNU2→  'STE   PNNU1X
        SET IX≡8,Y
        #JPQ  HEADING2
        #JPQ  PNNUGET
        LDA   DELTA1+1
        STA   DELTA1
        LDA   DELTA2+1
              DELTA2
        JPQ   PNNUT
…NUT1→  'STE   PNNUT1X
        DIFF≡DELTA1→DELTA2→BADOV
PNNUT1X→
        JPQ #
PNNUT2→ 'STE   PNNUT2X
        SUM≡DELTA1→DELTA2→BADOV
PNNUT2X→
        JPQ #
PNNUGET→
        'STE   PNNUGETX
```

```
         GETVAL≡0,1*8→DELTA2
         COM   DELTA2+1
PNHUGETX→
         JPQ  *
HOLDL→  'STE   HOLDLX
         SET IX≡8,7
         *JPQ  HEADING2
         PYTH≡DELTA1→→BADOV
         SKN   FIX
         STA  ◦ LIST+14
         STA   TS
         SKZ   FIX
         LDA  ◦ LIST+14
         DIFF→TS→BADOV
HOLDLX→ JPQ  *
FORCE→  'STE   FORCEX
         SET IX≡Δ,8,7
         *JPQ  HEADING2
         PYTH≡DELTA1→→BADOV
         STA   TS
         SKN   FIX
         STA  ◦ LIST+16
         SKZ   FIX
         LDA  ◦ LIST+16
         SUB   TS
         *JOV   BADOV
         STA   TS
         PROD*(-18)/(34359 7382 .)→BADOV
         DIFF→LIST+SVAL6→BADOV
FORCEX→ JPQ  *
DELTA1→  0
         0
DELTA2→  0
         0
DELTA3→  0
         0
RI→      *JPQ  377750
CL→      *JPQ  200000
ST→      *JPQ  200001
LA       ZZLAST
```

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IES ONLW 001

CALC 15 SEPT

76FAST=205574	H9.1=022125	PATAP
76LIGHTS=205605	H9.2=022133	PBOCC
76LOOP=205504	H9.3=022141	PBOCS
76LOOP1=205475	←HOIF	PBOCP
76LOOPAA=205326	←HEAD	PBOLE
76LOOPBB=205335	←HEADER	PBOLS
76LOOPB=205331	HOLDERS	PBOLP
76LOOPBC=205346	HOVCODE	PICBLKS
76LOOPC=205357	HOVP1	PICCHANGE
76LOOPD=205375	HOVP2	PICTURES
76LOOPA=205401	HOVS	PICTUREK
76LOOP2=205534	HOWBIG	PINS
76MOVI=205417	←HSUM	PLCLEAN
76MOVIX=205423	IBVCODE	PLEND
76MOVIT=205460	IBVERTS	PLOTIT
76MOVITX=205464	IBVW	PLOTNOSCOPE
76PUT=205301	INSTANCES	PLOTBLOCKS
76PUT1=205302	IP	PLOTSTORAGE
76PUNCH=205561	IPCI	PLOTSUB=205613
76U=205553	IPCONS	PLOTSUBEX=205632
AF1=207201	IPCOTP	PLOTSUBA=205625
AF1A=207235	IPCP	PLOTSUBB=205636
AF1B=207252	IPCV	PLPLOT
AFANG	ISIZE	PLPLBUSY
AFCEN	IVAL	PLPUNCH
AFEND=207255	IWHAT	PLPUBUSY
AFFB	JUNKK	PLS
AFOVER=207245	KIND	PMAG
AFST	L1=022155	PNAME
*AFTT=207414	L2=022201	POINTS
*AFTV=207415	L3=022225	PPART
ANGFX=207254	LAST=207263	PPARTM
ANGLEFIX=207200	←LDAB	←PROD
ARCTAN	←LDAE	PSAVE
ATATAP	LEP	PSEUDO
BADOV=200100	LETMAG	PSIZE
BASICFILE	←LGORR	PSNEED
BLOCKMAKER	*LGORR1	PSPL
BWHO[illegible]	*LGORR0	PUNCHIT
C[illegible]	*LGORREND	←PUTL
[illegible]CFR	*LGORR2	←PUTNAME
CEP	LINES	←PUTR
CHANGEPIC=204406	LIST	PVAL
CHANGE1=204425	LMAG	PWHOS
CHANGE2=204436	LMEND	PYTHAGORIAN
CHVAR	LMNAME	←PYTH1
CIRCEN	LMSTART	←PYTH
CIRCLES	LSP	Q1=022170
CL=207260	←LTAKE	Q14=022334

IES ONLW 002

CMAG	MAG=205643	Q2=022214
CMANG	MAG1=205732	Q3=022240
CMCEN	MAG1X=205735	Q4=022310
CMNAME	MAGCON=206125	Q5=022360
CMSTART	MAGC=205770	Q6=022430
▸COMB	MAGCX=206034	Q7=022264
COMP	MAGC1=206022	Q8=022404
CONLET	MAGCONEXIT=206254	READIT
CONSTK	MAGCONXP=206265	RELAX
CONSTRAINTS	MAGCONYP=206266	RI=207257
CPEX=205272	*MAGCONT=207433	▸ROTA
CPIC=204723	*MAGCONY=207434	ROTATER=207031
CPICX=205037	MAGCON1=206156	ROTATX=207067
CPIC1=204762	*MAGCONN=207435	*ROTS=207452
CPIC2=205001	MAGCON1X=206176	*ROTX=207450
CPICT=205040	*MAGCONT1=207436	*ROTY=207451
CPIC4=205056	*MAGCONYT=207437	S
CPIC3=205020	MAGCON2X=206234	SCALERS
CPII=205050	MAGCON2=206211	SCCEN
CPIIX=205077	MAGCONTAB=206255	SCSZ
CPIL=204707	MAGEX=205662	SHOWBLKS
CPILX=204722	MAGI=206543	SHOWCON
CPINUM=205100	MAGIX=206774	SHOWPOINTS
CPINUMX=205135	MAGI1=206561	SHOWINSASBOX
CPIP=204701	MAGIGO=206602	SHOWTOG
CPIPX=204706	MAGIGOA=206661	SHOWSCALERS
CPITXT=205136	MAGIASBOX=206635	SHOWTPVALS
CPITXTX=205170	MAGIGO1=206701	SIZE
CPIT=205245	MAGIGO2=206726	SIZER=206775
CPITT=205246	MAGILV=206754	SIZEX=207030
*CPMAXX=207420	MAGL=205736	▸SKIE
*CPMAXY=207421	MAGLX=205767	SMASBL
*CPMINX=207416	MAGNUM=206323	SNDISP
*CPMINY=207417	MAGNUMEX=206363	SPECB
CPNAME	MAGPIC=205663	SPLAT
CPNOTT=205236	MAGP=206035	SPLATT
CPNS=205171	MAGPICX=205714	SPLATTT
CPNSX=205223	MAGPICA=205676	SQRT
CPSX=205	MAGPX=206055	SSHOW
*CPTS=207423	MAGSCA=206420	ST=207261
*CPTT=207425	*MAGSCATS=207440	▸STAB
*CPTU=207422	*MAGSCAX=207441	▸STAE
TV=207424	*MAGSCAY=207442	STARTS=204400
CPWRAP=204454	MAGSCA2=206514	START76=205277
CPWRAPEO=205224	MAGSCAEX=206513	▸SUBR
CPWRAPX=204700	MAGSCA3=206530	*SUBR1
CPWRAPA=204535	*MAGSCAXS=207443	▸SUMM
CPWRAPB=204560	*MAGSCAXE=207444	SUPPLINES
CPWRAPC=204564	*MAGSCAYS=207445	SUPPINS
CPWRAPBX=204563	*MAGSCAYE=207446	SUPPNUMS

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IES ONLW 003

CPWRAPC1=204601	MAGSCA1=206461	SUPPTEXTS
CPWRAP1=204642	MAGSCA2X=206527	SVAL
CPWRAP2=204657	MAGSCA3X=206542	T
CPWRAP3=204663	MAGTPVAR=206056	*T1
CPWRAP2X=204662	MAGTXT=206267	*T2
CSP	MAGTPVX=206124	TEXTS
CSQ	*MAGTPX=207431	TEXTCNG
CURPICS	*MAGTPY=207432	TOPOS
CVAL	MAGTXTEX=206322	TPVAL
CVTS	*MAGTS=207447	TPVALS
DEADS	←MAKA	TRANSFORM=207106
DEGEN	MASBL	TRANSFORMX=207177
DEGEN1=205273	MASTERS	*TRANSFORMα=207453
DESIGS	←MASTER	TRANSFORMB=207115
←DIFF	MATD=200075	TRANS1=207126
←DIREC1	MATM=200071	TRANS2=207134
←DIREC	MATO=200072	TRANS4=207142
DISPLAY	MATRX=200073	TRANSFORMX1=207176
DISPLAYK	MATRY=200074	TUPLE
DRAWASFIX	MATS=200070	TVAL
ERRORSTOP	MERGERS	TXTS
←ERROR	MM0=022001	TYPE
←ERROR1	MM1=022007	UNIVBH
*EXLEVEL=207430	MM2=022015	V1=022251
*EXPAIRTS=207426	MM3=022023	V2=022275
*EXPAIRTT=207427	MM4=022031	V3=022321
EXPINS	MOVED	V4=022345
←FABVAL	←MOVE	V5=022371
FIX	←MOVEB	V6=022415
FIXEDS	←MOVEL	VA
FIXSAP	MOVINGDONE	VARIABLES
FREES	MOVIT	VARLOC
FREEDOMS←	MOVINGS	VCON
GETIT	NAME	VFLW
←GORR	NCON	VORD
*GORREXIT	NDISP	WHERE
H1=022037	NEWCONS	WHERESCA=206364
H10=022147	NLIST	WHERESUB=207070
H2=022045	NTOSHO	WHERESCAX=206417
H3=0220[illegible]	NUMBERS	WHERESUBX=207105
H4=022061	NVAL	WORKS
H5=022067	ONCIRCLES	*ZZLAST=207454
H6=022075	ONLINES	γ
[illegible]=022103	OPSPL=205273	•
H8=022111	ORIGIN	∆
H9=022117	OVERFLOWSTOP	∆ROT
		∆SIZE
		ß

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              IES   ONLW   004

ARCTAN=*JPQ   CACT                        =540500200010
AFANG= LIST+CVAL                          =      1024016
AFFB= LIST                                =        24000
AFST= CMSTART                             =       200022
AFCEN= CMCEN                              =       200024
ATATAP= 2     **ATTACHER THING            =            2

BASICFILE= 200033                         =       200033
BWHOS= 4      **TO WHICH PICTURE BLOCK BELONGS
                                          =            4
BLOCKMAKER= 200052                        =       200052

CACT= 200007+1                            =       200010
CVAL= 16      ** CIRCLE ANGLE AND RADIUS  =           16
CMSTART= 200022                           =       200022
CMCEN= 200024                             =       200024
CIRCEN= 14  ** CIRCLE CENTER              =           14
CSQ=RFD *+1                               =301200000001
CSP= 10       ** CIRCLE START POINT       =           10
CEP= 12       ** CIRCLE END POINT         =           12
CMANG= 200026                             =       200026
CIRCLES= 2*MASBL+PICTURES                 =        24225
CMAG= 200021                              =       200021
CMNAME= 200020+10                         =       200030
CPNAME= 200054                            =       200054
CONSTK= 3                                 =            3
CVTS= 6       ** VARIABLE TO MOVE TO SATISFY THIS
                                          =            6
CONLET= 12  **CONSTRAINT LETTER CODE      =           12
CHVAR= 20     ** # CHANGABLE VARIABLES    =           20
COMP= 16      **CONSTRAINT COMPUTATION ROUTINE
                                          =           16
CURPICS= 13*SMASBL+LIST+1                 =        24117
CONSTRAINTS= 4*SMASBL+LIST+1              =        24031
CCFR= LIST-2                              =        23776

DRAWASFIX=SKM 4.9 377720                  =   1711377720
DISPLAY= 5  **MASTER DISPLAY SUBROUTINE   =            5
DEADS= 11*SMASBL+LIST+1                   =        24067
DISPLA = 2                                =            2
DEGEN=*JMP  DEGEN1                        =400500205273
DESIGS= 13*SMASBL+LIST+1                  =        24103

   RSTOP =SKM 4.10 377731                 =   1712377731
EXPINS=SKM 4.10 EXPAIRTS **EXPANDING INSTANCE
                                          =   1712207426

FREES= 5*SMASBL+LIST+1                    =        24037
FIX=SKM 4.10 377720                       =   1712377720
FIXSAP= 200064                            =       200064
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                IES   ONLW   005

 FREEDOMS= 6*SMASBL+LIST+1                          =        24045

 FIXEDS= 12*SMASBL+LIST+1                           =        24075


 GETIT= 7      **MASTER FORMATION SUBROUTINE
                                                    =            7

*GORREXIT= 0                                        =            0


 HOWBIG= 6     **MASTER SCSZ COMPUTATION            =            6

 HOVS= 15*MASBL+PICTURES                            =        24561

 HOVP1= 10     ** FIRST HORIZ OR VERT POINT
                                                    =           10

 HOVP2= 12     ** SECOND HO1IZ OR VERT POINT
                                                    =           12

 HOVCODE= 14 ** HORIZ=1, VERTICAL=2, EITHER=0
                                                    =           14

 HOLDERS= 2*SMASBL+LIST+1                           =        24015


 IWHAT= 14     ** WHAT PIC THIS IS INSTANCE OF
                                                    =           14

 INSTANCES= 6*MASBL+PICTURES                        =        24345

 ISIZE= 16     ** R                                 =           16

 IPCONS= 11*MASBL+PICTURES                          =        24441

 IPCP= 10      **POINT IN INSTANCE-POINT CONSTRAINT
                                                    =           10

 IPCI= 12      ** INSTANCE IN INSTANCE-POINT CONSTRAIN
                              T                     =           12

 IPCV= 14      ** VIRGIN POINT IN INSTANCE-POINT CONST
                              RAINT                 =           14

 IP= LIST+IVAL+2                                    =        24022

 IVAL= 20      ** R COS 0, R SIN 0, X, Y            =           20

 IBVERTS= 14*MASBL+PICTURES                         =        24535

 IPCOTP= 16  ** INSTANCE-POINT CONSTRAINTS WITH THIS
                              VIRGIN                =           16

 IBVW= 10      ** WHICH INSTANCE IS VERTICAL
                                                    =           10

 IBVCODE= 12 ** INSTANCE TO BE VERTICAL, HORIZ, ETC
                                                    =           12


 JUNKK= 3                                           =            3


 KIND= 13      **1=NOT IN PIC, 2=PPART, 3=PICBLKS
                                                    =           13


 LIST= 24000 **LIST STRUCTURE START                 =        24000

 LSP= 10       **START OF LINE                      =           10

 LEP= 12       **END OF LINE                        =           12

 LINES= 1*MASBL+PICTURES                            =        24201

 LMSTART= 200022                                    =       200022

 LMEND= 200024                                      =       200024

 LMNAME= 200030                                     =       200030
```

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          ' IES  ONLW  006

 LMAG= 200020                                      =      200020
 LETMAG= 200015                                    =      200015
*LGORR1=                                           =      203515
*LGORR0=                                           =      203511
*LGORREND=                                         =      203523
*LGORR2=                                           =      203522

 MASBL= 24     **MASTER BLOCK LENGTH               =          24
 MOVED=SKM 4.10 SCSZ                               =  1712200034
 MOVINGDONE=SKM 4.10 200061                        =  1712200061
 MOVIT= 10     **HOW TO MOVE COORDINATES           =          10
 MASTERS= LIST+1                                   =       24001
 MERGERS= 10*SMASBL+LIST+1                         =       24061
 MOVINGS= 14*SMASBL+LIST+1                         =       24111

 NOISP= 200031                                     =      200031
 NUMBERS= 10*MASBL+PICTURES                        =       24415
 NLIST= 22000                                      =       22000
 NVAL= 16      ** R COS o, R SIN o, X, Y           =          16
 NTOSHO= 14  ** SCALER TO BE SHOWN                 =          14
 NCON= 17      ** # CONSTRAINTS SHOWN              =          17
 NEWCONS= 16*SMASBL+LIST+1                         =       24125
 NAME= 4       **NAME OF HEADER BLOCKS             =           4

 ONCIRCLES= 13*MASBL+PICTURES                      =       24511
 ORIGIN= 204400                                    =      204400
 OVERFLOWSTOP=SKM 4.10 377731                      =  1712377731
 ONLINES= 12*MASBL+PICTURES                        =       24465

 PICTURES= 22*SMASBL+LIST+1                        =       24155
 PLS= 14       ** LINES ND CIRCLES ON THIS POINT
                                                   =          14
 PVAL= 20      ** COORDINATES OF POINT             =          20
 POINTS= 4*MASBL+PICTURES                          =       24275
 PSPL= 200042                                      =      200042
 PNAME= 17     **NAME OF PICTURE, 36 BITS          =          17
 PSIZE= 16     **SIZE OF THIS PICTURE              =          16
 PPART= 4      **PICTURE PARTS                     =           4
 PINS= 14      **INSTANCES OF THIS PICTURE         =          14
 PICCHANGE=SKM 4.10 CPNAME                         =  1712200054
 PSNEED=SKM 4.10 200041                            =  1712200041
 PYTHAGORIAN= 200007                               =      200007
 PSEUDO= 200041                                    =      200041
 PMAG= 200017                                      =      200017
 PPARTM= 10  **MOVING PICTURE PARTS                =          10
 PLOTIT=SKM 4.8 377621                             =  1710377621
 PLCLEAN= 200130                                   =      200130
 PLPUNCH= 200132                                   =      200132
 PLEND= 200133                                     =      200133
 PUNCHIT=SKM 4.7 377621                            =  1707377621
```

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              IES   ONLW   007

 PLPUBUSY=SKM  4.10  200132                  =  1712200132
 PLOTNOSCOPE=SKM  4.10  200130               =  1712200130
 PLPLOT= 200131                              =      200131
 PLPLBUSY=SKM  4.10  200131                  =  1712200131
 PSAVE= 20    **6 REGISTERS TO SAVE IN PICTURE
                                             =          20

 PICBLKS= 2  **NON PICTURE STUFF IN PICTURE
                                             =           2

 PLOTBLOCKS= 200136                          =      200136
 PLOTSTORAGE= 200137                         =      300137
 PICTUREK= 1                                 =           1
 PATAP= 12    **ATTACHERS OF THIS PICTURE =             12
 PBOCC= 10    ** CENTER OF POINT ON CIRCLE
                                             =          10

 PBOCS= 12    ** START OF POINT ON CIRCLE =             12
 PBOCP= 14    ** POINT TO BE ON CIRCLE       =          14
 PBOLE= 10    ** END POINT OF LINE           =          10
 PBOLS= 12    ** START OF POINT ON LINE      =          12
 PBOLP= 14    ** POINT TO BE ON LINE         =          14
 PWHOS= 6     **PICTURE IN PICTURES          =           6

 RELAX= 200060                               =      200060
 READIT= 200066                              =      200066

 SMASBL= 6    **SMALL MASTER BLOCK LENGTH FOR DESIGNA
                           TERS              =           6
 SCSZ= 200034                                =      200034
 SQRT=*JPQ  200006                           =540500200006
 SNDISP= 200032                              =      200032
 SCCEN= 200035                               =      200035
 S= 7                                        =           7
 SPECB= 2     **SPECIFIC BLOCKS              =           2
 SCALERS= 3*MASBL+PICTURES                   =       24251
 SPLAT=#-NLIST,,#-NLIST                      =755777755777
 SVAL= 16     ** VALUE OF SCALER             =          16
 SSHOW= 14    ** NUMBERS SHOWING THIS SCALER
                                             =          14

 SHOWBLKS=SKM  4.9  377725  **SHOW NON DRAW JUNK
                                             =  1711377725
 SHOWCON=SKM  4.8  377725   **SHOW CONSTRAINTS
                                             =  1710377725
 SHOWPOINTS=SKM  4.7  377725      **SHOW POINTS
                                             =  1707377725
 SHOWINSASBOX=SKM  4.6  377725    **ENBOX INSTANCES
                                             =  1706377725
 SUPPLINES=SKM  4.4  377725 **DON'T SHOW LINES AND CIR
                           CLES              =  1704377725
 SUPPINS=SKM  4.5  377725   **DON'T EXPAND INSTANCES
                                             =  1705377725
 SIZE= 11     **SIZE OF BLOCK                =          11
```

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                    IES   ONLW   010

SPLATT=#-NLIST-SMASBL..#+ SMASBL-NLIST        =755771756005
SPLATTT=#-NLIST-MASBL..#-NLIST+MASBL.         =755753756023
SUPPNUMS=SKM 4.2 SHOWTOG                      = 1702377725
SHOWTOG= 377725                               =     377725
SUPPTEXTS=SKM 4.3 SHOWTOG                     = 1703377725
SHOWSCALERS=SKM 4.1 SHOWTOG                   = 1701377725
SHOWTPVALS=SKM 3.9 SHOWTOG                    = 1771377725
*SUBR1=                                       =     203525

TYPE= 0     **TIES TO SPECB IN MASTER BLOCK
                                              =          0
T= 10                                         =         10
TEXTS= 7*MASBL+PICTURES                       =      24371
TVAL= 14     ** R COS θ, R SIN θ, X, Y        =         14
TXTS= 20     ** POINTER TO TEXT SHOWN         =         20
TUPLE= 14    **# VARIABLES                    =         14
TEXTCNG= 200077                               =     200077
TPVAL= 14    **X,Y LOCATION                   =         14
TOPOS= 3*SMASBL+LIST+1                        =      24023
TPVALS= 5*MASBL+PICTURES **TYPICAL VARIABLES
                                              =      24321
*T1=                                          =     203514
*T2=                                          =     203512

UNIVBH= SMASBL.4..MASTERS-LIST                = 6004000001

VCON= 12     ** CONSTRAINTS ON THIS VARIABLE
                                              =         12
VA= LIST+PVAL                                 =      24020
VORD= 6      **ORDERING OF VARIABLES          =          6
VFLW= 10     ** CONSTRAINTS WHICH THIS VARIABLE IS T
                         O SATISFY            =         10
VARLOC= 15   **LOCATION OF VARIABLES IN BLOCK
                                              =         15
VARIABLES= 1*SMASBL+LIST+1                    =      24007

WORKS= 7*SMASBL+LIST+1                        =      24053
WHERE= 12    **LOCATION OF THING IN PICTURE
                                              =         12

γ= 3                                          =          3

θ= 1                                          =          1

Δ= 4                                          =          4
ΔSIZE= 200055        **KNOB CHANGE            =     200055
ΔROT= 200056         **KNOB CHANGE            =     200056

β= 2                                          =          2
```

```
**DEF MOVE|A→B
*LDE A
STE B
**END

**DEF MDIF|P.Q→R
LDA P
SUB Q
SCA {-1,-1,,-1,-1}+((Q)∧(770,1))
STA R
**END

**DEF DIFF≡P→Q=R→S
LDA P
SUB Q
*JOV S
STA R
**END

**DEF FABVAL≡P→Q
LDA P
JPA *+2
COM A
STA Q
**END

**DEF PYTHI≡P→Q,R→S=T→U
LDA R
SUB S
*JOV U+(S)-(S)
STA B+(R)-(R)
LDA P
SUB Q
*JOV U+(Q)-(Q)
*JPQ PYTHAGORIAN
*JOV U
STA T
**END

**DEF PYTH≡P→Q=T→U
PYTHI≡P→Q,P+1→Q+1=T→U
**END

**DEF DIRECI≡P→Q,R→S=T→U
LDA R
SUB S
*JOV U+(S)-(S)
STA B+(R)-(R)
LDA P
SUB Q
```

```
*JOV U+(Q)-(Q)
*JPQ CACT
STA T
**END

**DEF DIREC≡P→Q=T→U
DIREC1≡P→Q,P+1→Q+1=T→U
**END

**DEF ROTA≡α→G
LDA,VA
LDB,VA+1
*JPQ ROTATER
STA G
STB G+1
**END

**DEF HSUM≡P,Q→R
LDA P
ADD Q
SCA (-1,-1,,-1,-1)+((Q)∧(770,))
STA R
**END

**DEF SUMM≡P→Q=R→S
LDA P
ADD Q
*JOV S
STA R
**END

**DEF PROD≡A×B/C=D→E
LDA A
MUL B
DIV C
*JOV E
STA D
**END

**DEF LDAE≡A,B,C,D
LDA A
LDB A+B
LDC A+C
LDD A+D
**END

**DEF STAE≡A,B,C,D
STA A
STB A+B
STC A+C
```

```
STD A+D
▾▾END

▾▾DEF HEAD≡α→β
¹⁶RSXβ|αLIST
INXβ|α
▾▾END

▾▾DEF MOVEBI A≡B→C≡D
T1=A
T2=C
SKNT1,B
SUZT2,D
MKNT2,D
▾▾END

▾▾DEF GORR≡A≡α=β→B→C
¹DPXαT2+(C)-(C)
INXαA+1
JPQ T1+(C)-(C)
T2→    REXα0+(C)-(C)
JPQ C
T1→    RSXα|αLIST
¹⁶RSXβ|αLIST-1
INXβ|α⁰
DEXβ1
*LDEαLIST-1
¹SED {α}
JPQ T2+(C)-(C)
*JPQ B
JPQ T1+(C)-(C)
▾▾END

▾▾DEF LOAB≡A
LDA A
LDB A+1
▾▾END

▾▾DEF STAB≡P
STA P
STB P+1
▾▾END

▾▾DEF ERROR≡α→P
*JPQ {ERROR1≡α→P}
▾▾END

▾▾DEF ERROR1≡α→P
¹STE *+2
SKZ ERRORSTOP
```

IES ONLW 015

```
1#.
JPQ P
--END

--DEF PUTNAME≡0→LMNAME
SKZ EXPINS     **WORKING IN INST?
JPQ *+6
DPX0A
CYA (10..)
20CYA (0..-12000)
ITA (377..377)
STA LMNAME
--END

--DEF MAKA≡A→I
REX0A-LIST
*JPQ BLOCKMAKER
REXI|0
--END

--DEF COMB≡A→B*0
1RSXS|0A+LIST+1
SXDS|0A+1
JPQ *+14
REXS|0B+1
2RSXT|0A+LIST+1
1DPXS|TLIST
2EXXT|SLIST
1RSXS|0LIST+A+1
2DPXT|SLIST
1DPXS|TLIST
REXS|0A+1
*DPXSE
*2DPXSE
STESLIST
--END

--DEF LGORR≡N*XR=XR2→SUBR→LEXIT
GORREXIT=LEXIT
1DPXXRLGORR1
11RSXXR2|XRLIST+(N)+1
LGORR0→        16RSXXR|XR2LIST-1
*-1JNXXR*+2
1SKXXR1
INXXR|XR20
LGORR1→        SXDXR*  **MODIFIED
*JPQ GORREXIT+(GORREXIT/GORREXIT©1*(LGORREND+1))
11RSXXR2|XR2LIST
1DPXXR2LGORR2
*JPQ SUBR
```

```
----------------------------------------------

                    IES   ONLW   016

LGORR1→        SKX XR2 #          **MODIFIED

LGORREND→      JPQ LGORR0

⇒⇒END


⇒⇒DEF  PUTL≡N*XR→M*XR2

12 AUX XR {(N)+1, ,-((N)+1)}

12 RSX S|XR2 LIST+(M)+1

2 DPX S|XR LIST

12 RSX T|S LIST

1 DPX T|XR LIST

         2 DPX XR|T LIST

         1 DPX XR|S LIST

11 RSX S|XR2 LIST+(M)

*JPX S #+2

SKX S|XR2 0

1 DPX S|XR LIST-1

11 AUX XR {(N)+1, ,-((N)+1)}

⇒⇒END


⇒⇒DEF  PUTR≡N*XR→M*XR2

12 AUX XR {(N)+1, ,-((N)+1)}

11 RSX S|XR2 LIST+(M)+1

1 DPX S|XR LIST

12 RSX T|S LIST

2 DPX T|XR LIST

         2 DPX XR|S LIST

         1 DPX XR|T LIST

11 RSX S|XR2 LIST+(M)

*JPX S #+2

SKX S|XR2 0

1 DPX S|XR LIST-1

11 AUX XR {(N)+1, ,-((N)+1)}

⇒⇒END


⇒⇒DEF  LTAKE≡N*XR

12 RSX S|XR LIST+(N)+1

11 RSX T|XR LIST+(N)+1

1 DPX T|S LIST

2 EXX S|T LIST

1 DPX S|XR LIST+(N)+1

2 DPX S|XR LIST+(N)+1

1 DPX 0|XR LIST+(N)

⇒⇒END


⇒⇒DEF  SUBR≡A

         1 STE SUBR1

         A

SUBR1→ JPQ #

⇒⇒END
```

```
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

        IES   ONLW   017

**DEF  HEADER≡T→N→P
       T1 =P
       SMASBL,4,,T-LIST
       #-NLIST-SMASBL,,#+SMASBL-NLIST
       -2,0
       SPLAT
       N
       T1
**END

**DEF  MASTER≡T→N
       MASBL,4,,T-LIST
       #-NLIST-MASBL,,#-NLIST+MASBL
       -2,
       SPLAT
       N
**END

**DEF  *⊟A,B
       RSX_A|B LIST+A
**END

**DEF  MOVELEN≡N*XR→M*XR2
11RSX_S|XR LIST+(N)+1 ** TAKE
11RSX_T|XR LIST+(N)+1
1DPX_T|S LIST
2EXX_S|T LIST
1DPX_S|XR LIST+(N)+1
2EXX_S|XR2 LIST+(M)+1 ** PUT
2DPX_S|XR LIST+(N)+1
11RSX_T|S LIST
1EXX_T|XR LIST+(N)+1
1DPX_T|S LIST
**END

**DEF  SKIE≡N*a
       RSX_T|a LIST+N+1
       a11LDE_T LIST
       SXD_T*E
       JPQ  *+2
**END
```

IES ONLW 020

```
200067|
        JPQ  STARTS                        |140500 204400|    067
 200070|
MATS-   0                                  |000000 000000|200070
MATH-   0                                  |000000 000000|    071
MATO-   0                                  |000000 000000|    072
MATRX-  0                                  |000000 000000|    073
MATRY-  0                                  |000000 000000|    074
MATD-   0                                  |000000 000000|    075
 200100|
BADOV-  *'STE  *+2                         |413000 200102|200100
        *SKZ  OVERFLOWSTOP                 |601712 377731|    101
        2*76                               |020076 200102|    102
        JPQ  200001                        |140500 200001|    103
 CCFR+1|
        *JMP  MAGCON                       |400500 206125|    777
 NLIST|
        HOVS-LIST+MASBL                    |000000 000605|022000
MM0-    SMASBL.4..0**MASTERS               |006004 000000|    001
        SPLAT                              |000002 000002|    002
        -2.                                |775000 000000|    003
        MM4-NLIST+1..MM1-NLIST+1           |000032 000010|    004
        45.30..35.44          **UNIV       |045030 035044|    005
        0                                  |000000 000000|    006
MM1-    UNIVBH        **VARIABLES          |006004 000001|    007
        MM0-NLIST+SPECB+1..SPLATT          |000004 000016|022010
        -2.                                |775000 000000|    011
        V6-NLIST+1..V1-NLIST+1             |000416 000252|    012
        42.41..20.45          **VARS       |042041 020045|    013
        0                                  |000000 000000|    014
MM2-    UNIVBH        **HOLDERS            |006004 000001|    015
        SPLATT                             |000010 000024|    016
        -2.                                |775000 000000|    017
        H10-NLIST+1..H1-NLIST+1            |000150 000040|022020
        42.23..33.27          **HLDS       |042023 033027|    021
        0                                  |000000 000000|    022
MM3-    UNIVBH        **TOPOS              |006004 000001|    023
        SPLATT                             |000016 000032|    024
        -2.                                |775000 000000|    025
        L3-NLIST+1..L1-NLIST+1             |000226 000156|    026
        36.37..36.43          **TOPO       |036037 036043|    027
        0                                  |000000 000000|022030
MM4-    UNIVBH        **CONSTRAINTS        |006004 000001|    031
       *-NLIST-SMASBL..MM0-NLIST+SPECB+1
                                           |000024 000004|    032
        -2.                                |775000 000000|    033
        IPCONS-LIST+1..ONLINES-LIST+1
                                           |000442 000466|    034
        42.35..36.20                       |042035 036020|    035
        0                                  |000000 000000|    036
```

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            IES   ONLW    021

M1→     SMASBL,4,,MM2-NLIST         **FREES
                                    |006004 000015|    037
         MM2+SPECB+1-NLIST,,SPLATT  |000020 000046|022040
         -2,                        |775000 000000|    041
         SPLAT                      |000042 000042|    042
         24,24,,41,25               |024024 041025|    043
         0                          |000000 000000|    044
M2→     HEADER≡HOLDERS→(34,23,,41,25)      **FREEDOM
         SMASBL,4,,HOLDERS-LIST     |006004 000015|    045
        #-NLIST-SMASBL,,#+SMASBL-NLIST
                                    |000040 000054|    046.
        -2,0                        |775000 000000|    047
         SPLAT                      |000050 000050|022050
        (34,23,,41,25)              |034023 041025|    051
         T1                         |000000 000000|    052
M3→     HEADER≡HOLDERS→(42,32,,41,46)      **WORKS
         SMASBL,4,,HOLDERS-LIST     |006004 000015|    053
        #-NLIST-SMASBL,,#+SMASBL-NLIST
                                    |000046 000062|    054
        -2,0                        |775000 000000|    055
         SPLAT                      |000056 000056|    056
        (42,32,,41,46)              |042032 041046|    057
         T1                         |000000 000000|022060
M4→     HEADER≡HOLDERS→(41,26,,41,34)      **MRGR
         SMASBL,4,,HOLDERS-LIST     |006004 000015|    061
        #-NLIST-SMASBL,,#+SMASBL-NLIST
                                    |000054 000070|    062
        -2,0                        |775000 000000|    063
         SPLAT                      |000064 000064|    064
        (41,26,,41,34)              |041026 041034|    065
         T1                         |000000 000000|    066
M5→     HEADER≡HOLDERS→(42,23,,24,23)      **DEADS
         SMASBL,4,,HOLDERS-LIST     |006004 000015|    067
        #-NLIST-SMASBL,,#+SMASBL-NLIST
                                    |000062 000076|022070
        -2,0                        |775000 000000|    071
         SPLAT                      |000072 000072|    072
        (42,23,,24,23)              |042023 024023|    073
         T1                         |000000 000000|    074
M6→     HEADER≡HOLDERS→(42,47,,30,25)      **FIXED
         SMASBL,4,,HOLDERS-LIST     |006004 000015|    075
        #-NLIST-SMASBL,,#+SMASBL-NLIST
                                    |000070 000104|    076
        -2,0                        |775000 000000|    077
         SPLAT                      |000100 000100|022100
        (42,47,,30,25)              |042047 030025|    101
         T1                         |000000 000000|    102
M7→     HEADER≡HOLDERS→(42,26,,24,23)      **DEISGS
         SMASBL,4,,HOLDERS-LIST     |006004 000015|    103
        #-NLIST-SMASBL,,#+SMASBL-NLIST
```

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            IES  ONLW   022
        -2,0                              |775000 000000|  105
         SPLAT                            |000106 000106|  106
        (42,26,,24,23)                    |042026 024023|  107
         T1                               |000000 000000|022110
H8→     HEADER≡HOLDERS→(42,35,,45,34)    **MOVINGS
         SMASBL,4,,HOLDERS-LIST           |006004 000015|  111
        #-NLIST-SMASBL,,#+SMASBL-NLIST
                                          |000104 000120|  112
        -2,0                              |775000 000000|  113
         SPLAT                            |000114 000114|  114
        (42,35,,45,34)                    |042035 045034|  115
         T1                               |000000 000000|  116
H9→     HEADER≡HOLDERS→(22,37,,44,22)    **CURPICS
         SMASBL,4,,HOLDERS-LIST           |006004 000015|  117
        #-NLIST-SMASBL,,#+SMASBL-NLIST
                                          |000112 000126|022120
        -2,0                              |775000 000000|  121
         SPLAT                            |000122 000122|  122
        (22,37,,44,22)                    |022037 044022|  123
         T1                               |000000 000000|  124
H9+1→   HEADER≡HOLDERS→(35,22,,47,35)
         SMASBL,4,,HOLDERS-LIST           |006004 000015|  125
        #-NLIST-SMASBL,,#+SMASBL-NLIST
                                          |000120 000134|  126
        -2,0                              |775000 000000|  127
         SPLAT                            |000130 000130|022130
        (35,22,,47,35)                    |035022 047035|  131
         T1                               |000000 000000|  132
H9+2→   HEADER≡HOLDERS→(1,41,,37,42)
         SMASBL,4,,HOLDERS-LIST           |006004 000015|  133
        #-NLIST-SMASBL,,#+SMASBL-NLIST
                                          |000126 000142|  134
        -2,0                              |775000 000000|  135
         SPLAT                            |000136 000136|  136
        (1,41,,37,42)                     |001041 037042|  137
         T1                               |000000 000000|022140
H9+3→   HEADER≡HOLDERS→(2,41,,37,42)
         SMASBL,4,,HOLDERS-LIST           |006004 000015|  141
        #-NLIST-SMASBL,,#+SMASBL-NLIST
                                          |000134 000150|  142
        -2,0                              |775000 000000|  143
         SPLAT                            |000144 000144|  144
        (2,41,,37,42)                     |002041 037042|  145
         T1                               |000000 000000|  146
H10→     SMASBL,4,,MM2-NLIST              |006004 000015|  147
        #-NLIST-SMASBL,,MM2-NLIST+SPECB+1
                                          |000142 000020|022150
        -2,                               |775000 000000|  151
         SPLAT                            |000152 000152|  152
         3,41,,37,42                      |003041 037042|  153
```

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            IES    ONLW    023
        0                                |000000 000000|   154
        **PICTURE MASTER
L1→     MASBL.4..TOPOS-LIST              |024004 000023|   155
        MM3+SPECB+1-NLIST..SPLATTT
                                         |000026 000202|   156
        -2.                              |775000 000000|   157
        SPLAT                            |000160 000160|022160
        42,22,,30,37          **NAME     |042022 030037|   161
        *JPQ   MAGPIC**DISPLAY           |540500 205663|   162
        0       **HOWBIG                 |000000 000000|   163
        0       **GETIT                  |000000 000000|   164
        0       **MOVIT                  |000000 000000|   165
        30,16,,0     **SIZE              |030016 000000|   166
        0                                |000000 000000|   167
Q1→     PICTUREK     **KIND              |000000 000001|022170
        0       **TUPLE                  |000000 000000|   171
        0       **VARLOC                 |000000 000000|   172
  LINES+NLIST-LISTI
        **LINE MASTER
L2→     MASTER≡TOPOS→(24,35,,30,33)
        MASBL.4..TOPOS-LIST              |024004 000023|   201
        #-NLIST-MASBL..#-NLIST+MASBL
                                         |000156 000226|   202
        -2.                              |775000 0C0000|   203
        SPLAT                            |000204 000204|   204
        (24,35,,30,33)                   |024035 030033|   205
        *JMP   MAGL   **DISPLAY          |400500 205736|   206
        *JMP   CPIL   **HOWBIG           |400500 204707|   207
        0      **GETIT                   |000000 000000|022210
        DEGEN         **MOVIT            |400500 205273|   211
        14,14,,0      **SIZE             |014014 000000|   212
        0                                |000000 000000|   213
Q2→     DISPLAYK                         |000000 000002|   214
        0       **TUPLE                  |000000 000000|   215
        0       **VARLOC                 |000000 000000|   216
  CIRCLES+NLIST-LISTI
        **CIRCLE MASTER
L3→     MASBL.4..TOPOS-LIST              |024004 000023|   225
        #-NLIST-MASBL..MM3+SPECB+1-NLIST
                                         |000202 000026|   226
        -2.                              |775000 000000|   227
        SPLAT                            |000230 000230|022230
        22,41,,30,22          **CIRC     |022041 030022|   231
        *JMP   MAGC   **DISPLAY          |400500 205770|   232
        *JMP   CPIC   **HOWBIG           |400500 204723|   233
        0      **GETIT                   |000000 000000|   234
        DEGEN         **MOVIT            |400500 205273|   235
        20,16,,0      **SIZE             |020016 000000|   236
        0                                |000000 000000|   237
Q3→     DISPLAYK                         |000000 000002|022240
```

176

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------------------------------------------------------------
              IES  ONLW  024
      0     **TUPLE                         |000000 000000|  241
      0     **VARLOC                        |000000 000000|  242
  SCALERS+NLIST-LISTI
      **SCALER MASTER
 V1-   MASBL,4,,VARIABLES-LIST              |024004 000007|  251
      MM1+SPECB+1-NLIST,,SPLATTT
                                            |000012 000276|  252
     -2,                                    |775000 000000|  253
      SPLAT                                 |000254 000254|  254
      33,20,,22,42          **SCAL          |033020 022042|  255
     *JMP  MAGSCA**DISPLAY                  |400500 206420|  256
      DEGEN        **HOWBIG                 |400500 205273|  257
      0     **GETIT                         |000000 000000|022260
     *JMP  TRANSFORM       **MOVIT          |400500 207106|  261
      20,16,,0     **SIZE                   |020016 000000|  262
     *JMP  WHERESCA        **WHERE          |400500 206364|  263
 @7-    JUNKK                               |000000 000003|  264
      1     **TUPLE                         |000000 000001|  265
      SVAL **VARLOC                         |000000 000016|  266
 POINTS+NLIST-LIST1
      **POINT MASTER
 V2-   MASTER≡VARIABLES-(42,43,,35,37)
       MASBL,4,,VARIABLES-LIST              |024004 000007|  275
      #-NLIST-MASBL,,#-NLIST+MASBL
                                            |000252 000322|  276
     -2,                                    |775000 000000|  277
      SPLAT                                 |000300 000300|022300
     (42,43,,35,37)                         |042043 035037|  301
     *JMP  MAGP   **DISPLAY                 |400500 206035|  302
     *JMP  CPIP   **HOWBIG                  |400500 204701|  303
      0     **GETIT                         |000000 000000|  304
     *JMP  TRANSFORM       **MOVIT          |400500 207106|  305
      22,20,,0     **SIZE                   |022020 000000|  306
     *JMP  WHERESUB        **WHERE          |400500 207070|  307
 @4-    JUNKK                               |000000 000003|022310
      2     **TUPLE                         |000000 000002|  311
      PVAL **VARLOC                         |000000 000020|  312
 TPVALS-LIST+NLIST1
      **TYPICAL VARIABLE *
 V3-   MASTER≡VARIABLES-(41,45,,37,43)
       MASBL,4,,VARIABLES-LIST              |024004 000007|  321
      #-NLIST-MASBL,,#-NLIST+MASBL
                                            |000276 000346|  322
     -2,                                    |775000 000000|  323
      SPLAT                                 |000324 000324|  324
     (41,45,,37,43)                         |041045 037043|  325
     *JMP  MAGTPVAR        **DISPLAY
                                            |400500 206056|  326
      DEGEN        **HOWBIG                 |400500 205273|  327
      0     **GETIT                         |000000 000000|022330
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                 IES  ONLW  025
          *JMP  TRANSFORM      **MOVIT |400500 207106|    331
           16,14,,0    **SIZE          |016014 000000|    332
          *JMP  WHERESUB       **WHERE |400500 207070|    333
 @14→      JUNKK                       |000000 000003|    334
           2      **TUPLE              |000000 000002|    335
           TPVAL        **VARLOC       |000000 000014|    336
 INSTANCES+NLIST-LISTI
          **INSTANCE MASTER
 V4→      MASTER≡VARIABLES→(43,42,,35,30)
           MASBL,4,,VARIABLES-LIST     |024004 000007|    345
          #-NLIST-MASBL,,#-NLIST+MASBL
                                       |000322 000372|    346
          -2,                          |775000 000000|    347
           SPLAT                       |000350 000350|022350
          (43,42,,35,30)               |043042 035030|    351
          *JMP  MAGI   **DISPLAY       |400500 206543|    352
          *JMP  CPII   **HOWBIG        |400500 205050|    353
           0      **GETIT              |000000 000000|    354
          *JMP  TRANSFORM      **MOVIT |400500 207106|    355
           24,16,,0    **SIZE          |024016 000000|    356
          *JMP  WHERESUB       **WHERE |400500 207070|    357
 @5→       DISPLAYK                    |000000 000002|022360
           4      **TUPLE              |000000 000004|    361
           IVAL **VARLOC               |000000 000020|    362
 TEXTS+NLIST-LISTI
          **TEXT MASTER
 V5→      MASTER≡VARIABLES→(43,47,,24,43)
           MASBL,4,,VARIABLES-LIST     |024004 000007|    371
          #-NLIST-MASBL,,#-NLIST+MASBL
                                       |000346 000416|    372
          -2,                          |775000 000000|    373
           SPLAT                       |000374 000374|    374
          (43,47,,24,43)               |043047 024043|    375
          *JMP  MAGTXT**DISPLAY        |400500 206267|    376
          *JMP  CPITXT**HOWBIG         |400500 205136|    377
           0      **GETIT              |000000 000000|022400
          *JMP  TRANSFORM      **MOVIT |400500 207106|    401
           32,14,,0    **SIZE          |032014 000000|    402
          *JMP  WHERESUB       **WHERE |400500 207070|    403
 @6→       DISPLAYK                    |000000 000002|    404
           4      **TUPLE              |000000 000004|    405
           TVAL **VARLOC               |000000 000014|    406
 NUMBERS+NLIST-LISTI
          **NUMBER MASTER
 V6→       MASBL,4,,VARIABLES-LIST     |024004 000007|    415
          #-NLIST-MASBL,,MM1+SPECB+1-NLIST
                                       |000372 000012|    416
          -2,                          |775000 000000|    417
           SPLAT                       |000420 000420|022420
          (21,34,,44,35)      **NUMB   |021034 044035|    421
```

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              IES    ONLW    026

        *JMP   MAGNUM**DISPLAY          |400500 208223|     422
        *JMP   CPINUM**HOWBIG           |400500 205100|     423
         0     **GETIT                  |000000 000000|     424
        *JMP   TRANSFORM      **MOVIT   |400500 207106|     425
         22,16,,0    **SIZE             |022016 000000|     426
        *JMP   WHERESUB       **WHERE   |400500 207070|     427
06→     DISPLAYK                        |000000 000002|022430
         4     **TUPLE                  |000000 000004|     431
        NVAL **VARLOC                   |000000 000016|     432
ORIGIN|
```

```
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                    IES   ONLW   001

MATS→    0
MATM→    0
MATO→    0
MATRX→   0
MATRY→   0
MATD→    0
 2001001
BADOV→   ▸'STE  ▸+2
         ▸SKZ  OVERFLOWSTOP
         2▸76
         JPQ   200001
 CCFR+11
         ▸JMP   MAGCON
 NLIST1
          HOVS-LIST+MASBL
MM0→      SMASBL,4,,0**MASTERS
          SPLAT
         -2,
          MM4-NLIST+1,,MM1-NLIST+1
          45,30,,35,44          **UNIV
          0
MM1→      UNIVBH          **VARIABLES
          MM0-NLIST+SPECB+1,,SPLATT
         -2,
          V6-NLIST+1,,V1-NLIST+1
          42,41,,20,45          **VARS
          0
MM2→      UNIVBH          **HOLDERS
          SPLATT
         -2,
          H10-NLIST+1,,H1-NLIST+1
          42,23,,33,27          **HLDS
          0
MM3→      UNIVBH          **TOPOS
          SPLATT
         -2,
          L3-NLIST+1,,L1-NLIST+1
          36,37,,36,43          **TOPO
          0
MM4→      UNIVBH          **CONSTRAINTS
         ▸-NLIST-SMASBL,,MM0-NLIST+SPECB+1
         -2,
          IPCONS-LIST+1,,ONLINES-LIST+1
          42,35,,36,20
          0
H1→       SMASBL,4,,MM2-NLIST        **FREES
          MM2+SPECB+1-NLIST,,SPLATT
         -2,
          SPLAT
          24,24,,41,25
```

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--------------------------------------------

            IES   ONLW   002

        0

H2-     HEADER≡HOLDERS-(34, 23,, 41, 25)    **FREEDOM
H3-     HEADER≡HOLDERS-(42, 32,, 41, 46)    **WORKS
H4-     HEADER≡HOLDERS-(41, 26,, 41, 34)    **MRGR
H5-     HEADER≡HOLDERS-(42, 23,, 24, 23)    **DEADS
H6-     HEADER≡HOLDERS-(42, 47,, 30, 25)    **FIXED
H7-     HEADER≡HOLDERS-(42, 26,, 24, 23)    **DEISGS
H8-     HEADER≡HOLDERS-(42, 35,, 45, 34)    **MOVINGS
H9-     HEADER≡HOLDERS-(22, 37,, 44, 22)    **CURPICS
H9.1-   HEADER≡HOLDERS-(35, 22,, 47, 35)
H9.2-   HEADER≡HOLDERS-(1, 41,, 37, 42)
H9.3-   HEADER≡HOLDERS-(2, 41,, 37, 42)
H10-     SMASBL, 4,, MM2-NLIST
        0-NLIST-SMASBL,, MM2 -NLIST+SPECB+1
        -2,
         SPLAT
         3, 41,, 37, 42
         0
        **PICTURE MASTER
L1-      MASBL, 4,, TOPOS-LIST
         MM3+SPECB+1-NLIST,, SPLATTT
        -2,
         SPLAT
         42, 22,, 30, 37          **NAME
        *JPQ   MAGPIC**DISPLAY
         0       **HOWBIG
         0       **GETIT
         0       **MOVIT
         30, 16,, 0     **SIZE
         0
Q1-     PICTUREK     **KIND
         0       **TUPLE
         0       **VARLOC
 LINES+NLIST-LIST1
        **LINE MASTER
L2-    MASTER≡TOPOS-(24, 35,, 30, 33)
       *JMP   MAGL    **DISPLAY
       *JMP   CPIL    **HOWBIG
        0       **GETIT
        DEGEN         **MOVIT
        14, 14,, 0    **SIZE
        0
Q2-     DISPLAYK
        0       **TUPLE
        0       **VARLOC
CIRCLES+NLIST-LIST1
       **CIRCLE MASTER
L3-     MASBL, 4,, TOPOS-LIST
       0-NLIST-MASBL,, MM3+ SPECB+1-NLIST
       -2,
```

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----------------------------------------------
                IES  ONLW  003
      SPLAT
      22,41,,30,22        **CIRC
     *JMP  MAGC  **DISPLAY
     *JMP  CPIC  **HOWBIG
      0    **GETIT
      DEGEN        **MOVIT
      20,16,,0    **SIZE
      0
 @3-> DISPLAYK
      0     **TUPLE
      0     **VARLOC
 SCALERS+NLIST-LISTI
     **SCALER MASTER
 V1->  MASBL,4,,VARIABLES-LIST
      MM1+SPECB+1-NLIST,,SPLATTT
     -2,
      SPLAT
      33,20,,22,42        **SCAL
     *JMP  MAGSCA**DISPLAY
      DEGEN        **HOWBIG
      0     **GETIT
     *JMP  TRANSFORM     **MOVIT
      20,16,,0    **SIZE
     *JMP  WHERESCA     **WHERE
 @7-> JUNKK
      1     **TUPLE
      SVAL **VARLOC
 POINTS+NLIST-LISTI
     **POINT MASTER
 V2-> MASTER≡VARIABLES→(42,43,,35,37)
     *JMP  MAGP  **DISPLAY
     *JMP  CPIP  **HOWBIG
      0     **GETIT
     *JMP  TRANSFORM     **MOVIT
      22,20,,0    **SIZE
     *JMP  WHERESUB     **WHERE
 @4-> JUNKK
      2     **TUPLE
      PVAL **VARLOC
 TPVALS-LIST+NLIST'I
     **TYPICAL VARIABLE *
 V3-> MASTER≡VARIABLES→(41,45,,37,43)
     *JMP  MAGTPVAR     **DISPLAY
      DEGEN        **HOWBIG
      0     **GETIT
     *JMP  TRANSFORM     **MOVIT
      16,14,,0    **SIZE
     *JMP  WHERESUB     **WHERE
 @14-> JUNKK
      2     **TUPLE
```

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-----------------------------------------------------------
                IES   ONLW   004
        TPVAL         **VARLOC
  INSTANCES+NLIST-LISTI
        **INSTANCE MASTER
  V4→      MASTER≡VARIABLES→(43,42,,35,30)
        *JMP  MAGI   **DISPLAY
        *JMP  CPII   **HOWBIG
         0      **GETIT
        *JMP  TRANSFORM     **MOVIT
         24,16,,0     **SIZE
        *JMP  WHERESUB      **WHERE
  Q5→      DISPLAYK
         4      **TUPLE
         IVAL **VARLOC
  TEXTS+NLIST-LISTI
        **TEXT MASTER
  V5→      MASTER≡VARIABLES→(43,47,,24,43)
        *JMP  MAGTXT**DISPLAY
        *JMP  CPITXT**HOWBIG
         0      **GETIT
        *JMP  TRANSFORM     **MOVIT
         32,14,,0     **SIZE
        *JMP  WHERESUB      **WHERE
  Q8→      DISPLAYK
         4      **TUPLE
         TVAL **VARLOC
  NUMBERS+NLIST-LISTI
        **NUMBER MASTER
  V6→      MASBL,4,,VARIABLES-LIST
        #-NLIST-MASBL,,MMI+SPECB+I-NLIST
        -2,
         SPLAT
        (21,34,,44,35)        **NUMB
        *JMP  MAGNUM**DISPLAY
        *JMP  CPINUM**HOWBIG
         0      **GETIT
        *JMP  TRANSFORM     **MOVIT
         22,16,,0     **SIZE
        *JMP  WHERESUB      **WHERE
  Q6→      DISPLAYK
         4      **TUPLE
         NVAL **VARLOC
  ORIGINI
  STARTS→ CSQ76
        MKZ  PLPUBUSY
        MKZ  PLPLBUSY
        MKZ  PLOTNOSCOPE
        MKZ  PICCHANGE
        JPQ  START76
  CHANGEPIC→
        'STE  CPEX
```

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            IES   ONLW   005
      REX 0 DESIGS-LIST
      LGORR≡SPECB*0=S→CHANGE1→CHANGE2
CHANGE1→
      SUBR≡(LTAKE≡VORD*0)
CHANGE2→
      REX 0 CURPICS-LIST
      LGORR≡SPECB*0=S→CPWRAP→CPWRAPED
CPWRAP→'STE   CPWRAPX
      LTAKE≡PWHOS*0
      COMB≡PPARTM→PPART*0
      SKIE≡PINS*0
      JPQ   CPWRAPX
      SKIE≡PPART*0
      JPQ   CPWRAPA
      SKIE≡PICBLKS*0
      JPQ   CPWRAPA
      REX 8 FREES-LIST
      MOVEL≡TYPE*0→SPECB*8
      'DPX 8|0 LIST+TYPE
CPWRAPA→
      LDA  (-(8))
      STA   CPMINX
      STA   CPMINY
      COM   A
      STA   CPMAXX
      STA   CPMAXY
      LGORR≡PPART*0=S→CPWRAPB→CPWRAPC
CPWRAPB→
      'STE   CPWRAPBX
      S⊟TYPE.0
      *BPQ S HOWBIG+LIST
CPWRAPBX→
      JPQ  #
CPWRAPC→
      LGORR≡PICBLKS*0=S→CPWRAPB
CPWRAPC1→
      HDIFICPMAXY.CPMINY→ B
      JNA  #+2
      JPQ  #+2
      LDB  ( 100,.)
      HDIFICPMAXX.CPMINX
      JNA  #+2
      JPQ  #+2
      LDA  ( 100,.)
      SUB   B
      JNA  #+3
      ADD   B
      STA   B
      STB   LIST+PSIZE0
      HSUM≡CPMAXY.CPMINY→MATRY
```

```
            IES   ONLW   ***
        HSUM≡CPMAXX,CPMINX→MATRX
        COM   MATRY
        COM   MATRX
        *LDA (-(*))
        STA   MATM
        STA   MATS
        STA   MATO
        OPX   MATO
 CPWRAP1→
        LGORR≡PPART**=S→CPWRAP2→CPWRAP3
 CPWRAP2→
        'STE   CPWRAP2X
        S⊞TYPE,*
        *BPQ s LIST+MOVIT
 CPWRAP2X→
        JPQ *
 CPWRAP3→
        LGORR≡PICBLKS**=S→CPWRAP2
 CPWRAPX→
        JPQ *
 CPIP→  'STE   CPIPX **FOR A POINT
        ROTA≡*
        *JPQ   CPNS   **MINI MAX
 CPIPX→ JPQ *
 CPIL→  'STE   CPILX **FOR A LINE
        S⊞LEP,*
        ROTA≡S
        *JPQ   CPNS
        S⊞LSP,*
        ROTA≡S
        *JPQ   CPNS
 CPILX→ JPQ *
 CPIC→  'STE   CPICX **FOR A CIRCLE
        S⊞CEP,*
        ROTA≡S→AFEND
        *JPQ   CPNS
        S⊞CSP,*
        ROTA≡S→AFST
        *JPQ   CPNS
        T⊞CIRCEN,*
        ROTA≡T→AFCEN
        PYTH≡VA_T→VA_S=CPTU→BADOV
 CPIC1→ STA * LIST+CVAL+1
        MUL   MATS
        STA   CPTU   **RADIUS
        DIREC≡AFST→AFCEN=CPTS→BADOV
        MOVE≡LIST+CVAL*→CPTV
        REX s *
 CPIC2→ LDA s CPICT
        SUB   CPTS
```

IES ONLW 007

```
        SKZ 4.9 CPTV
        COM  A
        JPA  *+3
        JNA  *+2
        DPX  A
        DPX  B
        CAB  (-1.)
        STA  B
        LDA  CPTV
        JPA  *+2
        COM  A
        SUB  B
        JNA  CPIC4
CPIC3-  LDA  CPTU
        SKZ  1.1|S CPICT+1
        COM  A
        SKZ  1.2|S CPICT+1
        DPX  A
        ADD  AFCEN+1
        STA  B
        LDA  CPTU
        SKZ  1.3|S CPICT+1
        COM  A
        SKZ  1.4|S CPICT+1
        DPX  A
        ADD  AFCEN
        *JPQ  CPNS
CPIC4-  -2JPX  5 CPIC2
CPICX-  JPQ  *
CPICT-  0
        2
        200.
        10
        400.
        6
        600.
        11
CPII-   'STE  CPIIX
        PYTH=LIST+IVAL0.LIST+IVAL+10=LIST+ISIZE0-BAD
                            OV
        STA  CPTS
        SUMM-LIST+IVAL+30= B-BADOV
        SUMM=CPTS-LIST+IVAL0+2-BADOV
        *JPQ  CPNS
        DIFF=LIST+IVAL+30-CPTS= B-BADOV
        DIFF=LIST+IVAL+20-CPTS-BADOV
        *JPQ  CPNS
CPIIX-  JPQ  *
CPINUM-'STE  CPINUMX
        SUMM=NVAL+LIST+10-  A-BADOV
```

```
                IES   ONLW   010
      SUMM←NVAL+LIST+1D=CPTU←BADOV
      SUMM←NVAL+LIST+3D= B←BADOV
      SUMM≡NVAL+LISTD← A←BADOV
      SUMM←NVAL+LISTD=CPTV←BADOV
      SUMM←NVAL+LIST+2D←BADOV
      *JPQ  ROTATER
      *JPQ  CPNS
      DIFF≡NVAL+LIST+3D←CPTU= B←BADOV
      DIFF≡NVAL+LIST+2D←CPTV←BADOV
      *JPQ  ROTATER
      *JPQ  CPNS
CPINUMX←
      JPQ  *
CPITXT←'STE  CPITXTX
      PROD≡TVAL+LISTD×TXTS+LISTD
      SAB  {-1,}
      STB  CPTU
      PROD≡TVAL+LIST+1D×TXTS+LISTD
      SAB  {-1,}
      DIFF≡TVAL+LIST+3D← B= B←BADOV
      SUMM≡TVAL+LIST+2D←CPTU←BADOV
      *JPQ  ROTATER
      *JPQ  CPNS
      SUMM≡TVAL+1+LISTD←TVAL+LIST+3D= B←BADOV
      DIFF≡TVAL+LIST+2D←TVAL+LISTD←BADOV
      *JPQ  ROTATER
      *JPQ  CPNS
CPITXTX←
      JPQ  *
CPNS←  'STE  CPNSX
      STA  CPTT
      SUB  CPMAXX
      SCA  {-1,}
      JNA  *+3
      LDA  CPTT
      STA  CPMAXX
      LDA  CPTT
      SUB  CPMINX
      SCA  {-1,}
      JPA  *+3
      LDA  CPTT
      STA  CPMINX
      STB  CPTT
      LDA  B
      SUB  CPMAXY
      SCA  {-1,}
      JNA  *+3
      LDA  CPTT
      STA  CPMAXY
      LDA  CPTT
```

```
                    IES   ONLW   011
          SUB   CPMINY
          SCA   (-1,)
          JPA   *+3
          LDA   CPTT
          STA   CPMINY
   CPNSX- JPQ
   CPWRAPED-
          RSX , PICTURES+SPECB+1
   CPSX-  SXD , PICTURES+SPECB+1-LIST
          JPQ   CPNOTT
          REX 0|8
          DEX , 1
          *LDE , LIST+PNAME
          'SED  CPNAME**PIC CALLED FOR
          JPQ   CPIT
          RSX 8|8 LIST
          JPQ   CPSX
   CPNOTT-MAKA=PICTURES-0
          LDA   CPNAME
          STA , PNAME+LIST
          LDA  ( 100,,)
          JPQ   CPITT
   CPIT-  LDA , PSIZE+LIST
   CPITT- MUL  ( 220,)
          ADD   A
          *JOV  BADOV
          STA   SCSZ
          REX , CURPICS-LIST
          PUTL=PWHOS*0-SPECB*8
          DPX   SCCEN
          DPX   SCCEN+1
          MKZ   PICCHANGE
   CPEX-  JPQ *
   DEGEN1-STE '*+1
          JPQ *
   OPSPL- 0
          0
   START76-
          *JPQ  CHANGEPIC
          DPX   SNDISP
   76PUT- *JPQ  MAG
   76PUT1-MOVEINDISP-BASICFILE
   76LOOP-*JPQ  PSEUDO
          RSX , MOVINGS+SPECB+1
          SXD , MOVINGS-LIST+SPECB+1
          JPQ   76LOOP1
          *JPQ  TEXTCNG
          LDB   *ROT
          LDA  ( 200,)
          STAB=MATM
```

```
-------------------------------------------------------------
              IES   ONLW   012
     *JPQ   PYTHAGORIAN
     *JOV   BADOV
     STA   MATS
     MUL   *SIZE
     ADD   MATS
     *JOV   BADOV
     STA   MATD
     DPX   MATRX
     DPX   MATRY
76LOOPAA→
     *LDE   SPECB+MOVINGS+1
     17SED   E
     JPQ   76LOOPBB
76LOOPB→
     LDAB≡OPSPL
     *JPQ   ROTATER
     JPQ   76LOOPBC
76LOOPBB→
     RSX  a  SPECB+MOVINGS+1
     16AUX  a|a  LIST-1
     DEX  a  1
     RSX  S|a  LIST+TYPE
     RSX  a|S  LIST+TUPLE
     SXD  a  2
     JPQ  *+2
     JPQ   76LOOPB
     *BPQ  S  LIST+WHERE
76LOOPBC→
     SUB   PSPL
     STD   OPSPL
     COM   A
     STA   MATRX
     LDA   B
     SUB   PSPL+1
     STD   OPSPL+1
     COM   A
     STA   MATRY
76LOOPC→
     REX  a  MOVINGS-LIST
     LGORR≡SPECB×a=S→76LOOPD→76LOOPA
76LOOPD→
     1STE  *+1
     RSX  S|a  LIST+TYPE
     *BPQ  S  MOVIT+LIST
     JPQ  *
76LOOPA→
     REX  a  MOVINGS-LIST
     LGORR≡SPECB×a=S→76MOVI→76LOOP1
76MOVI→1STE   76MOVIX
     RSX  S|a  LIST+TYPE
```

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```
            IES   ONLW   011
      SXD  S INSTANCES-LIST
      JPQ  *+2
76MOVIX-
      JPQ  *
      LDAE≡IVAL+LIST0,1,2,3
      STAE≡MATH,1,2,3
      *JPQ  PYTHAGORIAN
      *JOV  BADOV
      STA   MATS
      STA  0 LIST+ISIZE
      Y⊟IWHAT,0
      MOVEIPSIZE+LISTY→MATD
      LGORREVCON*0=S→76MOVIT→76MOVIX
76MOVIT-
      'STE  76MOVITX
      *LDE 0 LIST+TYPE
      'SED (  IPCONS-LIST)
      JPQ  *+2
76MOVITX-
      JPQ  *
      S⊟IPCV,0
      ROTA≡S
      S⊟IPCP,0
      STAB≡VAS
      JPQ   76MOVITX
76LOOP1-
      LDAB≡PSPL
      STAB≡OPSPL
      DPX   ASIZE
      DPX   AROT
      LDA   BASICFILE
      *SZZ  MOVINGDONE
      JPQ   76PUT1
      STA   NDISP
      LDA  (-(0))
      STA   MATH     **DIAGONAL MATRIX
      STA   MATD     **MATRIX DENOM
      STA   MATS     **PYTH OF MATH, MATD
      DPX   MATD     **OFF DIAGONAL
      DPX   MATRX    **X TRANSLATION
      DPX   MATRY    **Y TRANSLATION
      REX  0 CURPICS-LIST
      LGORR≡SPECB*0=S→76LOOP2→76U
76LOOP2-
      SUBR≡(LGORR≡PPARTH*0=S→MAG1)
76U-  MOVEINDISP→SNDISP
      SKZ   PICCHANGE
      JPQ   START76
      SZZ   MOVED
      JPQ   76PUT
```

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```
76PUNCH→
        SKN  PUNCHIT
        SKZ  PLOTIT
        *JPQ  PLOTSUB
        SKN  FIX
        JPQ  #+7
        *JPQ  RELAX
        MKN  MOVED
        *JPQ  READIT
        SKN  DRAWASFIX
        JPQ  #-6
        JPQ  76PUT
76FAST→SKN  4.10 377721
        JPQ  #+5
        *JPQ  FIXSAP
        *JPQ  MAG
        MOVEINDISP→BASICFILE
        *JPQ  READIT
        SZZ  PSNEED
        JPQ  76LOOP
76LIGHTS→
        LDD  SNDISP
        ²²LDD  AFFB
        LDC  SCSZ
        LDA  PLOTBLOCKS
        LDB  PLOTSTORAGE
        JPD  76LOOP
PLOTSUB→
        ¹STE  PLOTSUBEX
        *JPQ  PLCLEAN
        SKZ  PLOTIT
        *JPQ  PLPLOT
        SKZ  PUNCHIT
        *JPQ  PLPUNCH
        MKN  PLOTNOSCOPE
        *JPQ  MAG
        MKZ  PLOTNOSCOPE
        *JPQ  PLEND
PLOTSUBA→
        LDA  PLOTBLOCKS
        LDB  PLOTSTORAGE
        SKZ  PLPUBUSY
        JPQ  PLOTSUBB
        SKN  PLPLBUSY
PLOTSUBEX→
        JPQ  #
        SKZ  PUNCHIT
        *JPQ  PLPUNCH
        JPQ  PLOTSUBA
PLOTSUBB→
        SKZ  PLPLBUSY
```

```
                    IES  ONLW  015
       JPQ   PLOTSUBA
       SKZ   PLOTIT
       *JPQ   PLPLOT
       JPQ   PLOTSUBA
MAG→   'STE   MAGEX
       REX  * CURPICS-LIST
       LGORR≡SPECB**=S→MAGPIC
MAGEX→  JPQ  *
MAGPIC→'STE   MAGPICX
       MKZ  EXPINS
       DPX  0|0  LIST+PSAVE
       DPX  NDISP
       LDA  (-(#))
       STA   MATM     **DIAGONAL MATRIX
       STA   MATD     **MATRIX DENOM
       STA   MATS     **PYTH OF MATM, MATO
       DPX   MATO     **OFF DIAGONAL
       DPX   MATRX    **X TRANSLATION
       DPX   MATRY    **Y TRANSLATION
MAGPICA→
       LGORR≡PPART**=S→MAGI
       SKN   SHOWBLKS
MAGPICX→
       JPQ  *
       LGORR≡PICBLKS**=S→MAGI→MAGPICX
MAGI→  'STE   MAGIX
       Y⊟TYPE.*
       *BPQ  Y  LIST+DISPLAY
MAGIX→ JPQ  *
MAGL→  'STE   MAGLX
       SKZ   SUPPLINES
       SKZ   EXPINS
       JPQ  *+2
       JPQ   MAGLX
       PUTNAME≡0→LMNAME
       Y⊟LSP.*
       ROTA≡Y→LMSTART
       Y⊟LEP.*
       ROTA≡Y→LMEND
       *JPQ   LMAG
MAGLX→ JPQ  *
MAGC→  'STE   MAGCX
       SKZ   SUPPLINES
       SKZ   EXPINS
       JPQ  *+2
       JPQ   MAGCX
       Y⊟CIRCEN.*
       ROTA≡Y→CMCEN
       Y⊟CSP.*
       ROTA≡Y→CMSTART
```

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```
-----------------------------------------------------------
                IES   ONLW   011
        SKZ   EXPINS
        JPQ   MAGC1
        Y⊟CEP.0
        ROTA≡Y→AFEND
        *JPQ   ANGLEFIX
MAGC1→  LDA 0 CVAL+LIST
        STA   CMANG
        PUTNAME≡0→CMNAME
        *JPQ   CMAG
MAGCX→  JPQ *
MAGP→   'STE   MAGPX
        SKN   SHOWPOINTS
        JPQ   MAGPX
        ROTA≡0→LMSTART
        PUTNAME≡0→LMNAME
        *JPQ   PMAG
MAGPX→  JPQ *
MAGTPVAR→
        'STE   MAGTPVX
        SKN   SHOWTPVALS
        JPQ   MAGTPVX
        PUTNAME≡0→LMNAME
        LDAB≡TPVAL+LIST0
        *JPQ   ROTATER
        STA   MAGTPX
        STB   MAGTPY
        LDA   SCSZ
        MUL  (10.)
        STA   B
        SUMM→MAGTPX=LMSTART→BADOV
        SUMM≡MAGTPY→ B=LMSTART+1→BADOV
        DIFF≡MAGTPX→ B=LMEND→BADOV
        DIFF≡MAGTPY→ B=LMEND+1→BADOV
        *JPQ   LMAG
        LDA   LMEND
        EXA   LMSTART
        STA   LMEND
        *JPQ   LMAG
MAGTPVX→
        JPQ *
MAGCON→'STE   MAGCONEXIT
        SKN   SHOWCON
        JPQ   MAGCONEXIT
        PUTNAME≡0→LMNAME
        T⊟CHVAR,Y     ** Y=TYPE
        DPX   MAGCONXP
        DPX   MAGCONYP
        DPX   A
        LDB  (1)      ** 1/2
        DPX  T D
```

IES ONLW 017

```
        DIV  D
        INX TIT
        DPX T MAGCONT
        DPX Y MAGCONY
        INX 0 CVTS+LIST+2
        1DPX 0 MAGCON1
        *JOV  BADOV
        STA  MAGCONN**1/NUMBER OF TIES*2
        JPQ  MAGCON1X
MAGCON1→
        LDA T*          **SET TO FIRST VARIABLE
        DPX T MAGCONT1
        RSX 0 A
        Y⊟TYPE.0
        *BPQ Y LIST+WHERE  **FIND PLACE OF TIE
        STB  MAGCONYT
        MUL  MAGCONN
        SUMM→MAGCONXP=MAGCONXP→BADOV
        PROD≡MAGCONN×MAGCONYT
        SUMM→MAGCONYP=MAGCONYP→BADOV
        RSX T MAGCONT1
MAGCON1X→
        -2JPX T MAGCON1
        SUMM≡MAGCONXP→  A=MAGCONXP→BADOV
        SUMM≡MAGCONYP→  A=MAGCONYP→BADOV
        RSX T MAGCONT
        JPQ  MAGCON2X
MAGCON2→
        LDA *MAGCON1
        DPX T MAGCONT1
        RSX 0 A
        Y⊟TYPE.0
        *BPQ Y LIST+WHERE
        STAB≡LMEND
        RSX T MAGCONT1
        PROD≡SCSZ×MAGCONTAB T
        SUMM→MAGCONXP=LMSTART→BADOV
        PROD≡SCSZ×MAGCONTAB+1T
        SUMM→MAGCONYP=LMSTART+1→BADOV
        *JPQ  LMAG
MAGCON2X→
        -2JPX T MAGCON2
        LDAB≡MAGCONXP
        STAB≡CMCEN
        MOVE1(-(8))→CMANG
        *JPQ  CMAG
        RSX Y MAGCONY
        LDA Y LIST+CONLET  **LABEL LETTER
        STA  CMANG
        LDA ( 10.)
```

```
--------------------------------------------------
                IES  ONLW  020
        MUL  SCSZ
        STA  LMSTART
        DPX  LMSTART+1
        *JPQ  LETMAG
MAGCONEXIT→
        JPQ  *
MAGCONTAB→
        0
        20.
        20.
        0
        0
        -(20.)
        -(20.)
        0
MAGCONXP→
        0
MAGCONYP→
        0
MAGTXT→'STE  MAGTXTEX
        SKZ  SUPPTEXTS
        SKZ  EXPINS
        JPQ  *+2
        JPQ  MAGTXTEX
        PUTNAME≡a→LMNAME
        LDAB≡LIST+TVALa
        *JPQ  SIZER
        STAB≡200022
        LDAB≡LIST+TVAL+2a
        *JPQ  ROTATER
        STAB≡200024
        ¹³LDA a LIST+TXTS
        ²⁷STA  200026
        INX a LIST+TXTS+1
        ¹DPX a 200026
        *JPQ  200014
MAGTXTEX→
        JPQ  *
MAGNUM→'STE  MAGNUMEX
        SKZ  SUPPNUMS
        SKZ  EXPINS
        JPQ  *+2
        JPQ  MAGNUMEX
        PUTNAME≡a→LMNAME
        LDAB≡LIST+NVALa
        *JPQ  SIZER
        STAB≡200022
        LDAB≡LIST+NVAL+2a
        *JPQ  ROTATER
        STAB≡200024
```

```
-------------------------------------------------

                IES   ONLW   021

     RSX ¤|¤ LIST+NTOSHO
     PRODELIST+SVAL,*MATS/MATD→BADOV
     MUL ( 9964324126.)
     DIV ( 4.) ←
     ADD ( 0)
     STA   200026 **IGNORE OVERFLOW BECAUSE YOU CA
                            N'T FIX IT
     *JPQ   200016
MAGNUMEX→
     JPQ *
WHERESCA→
     'STE   WHERESCAX
     DPX   MAGSCATS
     DPX   MAGSCAX
     DPX   MAGSCAY
     LGORRESSHOW*0=S→MAGSCA1
     LDA   MAGSCAX
     SAB  (-33.)
     DIV   MAGSCATS
     STA   MAGSCAX
     LDA   MAGSCAY
     SAB  (-33.)
     DIV   MAGSCATS
     STA   MAGSCAY
     STA   B
     LDA   MAGSCAX
WHERESCAX→
     JPQ *
MAGSCA→'STE   MAGSCAEX
     SKN   SHOWSCALERS
     JPQ   MAGSCAEX
     *JPQ   WHERESCA
     PUTNAME=0→LMNAME
     LGORRESSHOW*0=S→MAGSCA1
     LDA   SCSZ
     MUL  ( 20.)
     REX  5 3
     STA   MAGSCAXS
     STA   MAGSCAXE
     SCA  (-2.)
     STA   MAGSCAYS
     STA   MAGSCAYE
     COM   MAGSCAXE
MAGSCA1→
     SUMM=MAGSCAX→MAGSCAXS=LMSTART→BADOV
     SUMM=MAGSCAX→MAGSCAXE=LMEND→BADOV
     SUMM=MAGSCAY→MAGSCAYS=LMSTART+1→BADOV
     SUMM=MAGSCAY→MAGSCAYE=LMEND+1→BADOV
     *JPQ   LMAG
     LDA   MAGSCAYE
```

```
--------------------------------------------------------------------------
                    IES  ONLW   022
         EXA  MAGSCAXE
         COM  A
         STA  MAGSCAYE
         LDA  MAGSCAYS
         EXA  MAGSCAXS
         COM  A
         STA  MAGSCAYS
         -1JPX S MAGSCA1
MAGSCAEX-
         JPQ  *
MAGSCA2-
         1STE  MAGSCA2X
         REX  S 1
         ADX  S MAGSCATS
         SUMM=MAGSCAX-LIST+NVAL+2*=MAGSCAX-BADOV
         SUMM=MAGSCAY-LIST+NVAL+3*=MAGSCAY-BADOV
MAGSCA2X-
         JPQ  *
MAGSCA3-
         1STE  MAGSCA3X
         LDAB=LIST+NVAL+2*
         STAB=LMEND
         LDA  MAGSCAX
         LDB  MAGSCAY
         STAB=LMSTART
         *JPQ  LMAG
MAGSCA3X-
         JPQ  *
MAGI-    1STE  MAGIX
         PROD=LIST+ISIZE*=MATS/MATD-BADOV
         FABVAL
         STA  MAGTS
         SCA  (-1,)
         ADD  MAGTS
         STA  MAGTS
         DIV  SCSZ
         *JOV  *+3
         SUB  ( 400,,)
MAGI1-   JNA  MAGIX  **DONT EXPAND
         LDAB=IP*
         ROTA
         SUB  SCCEN
         FABVAL
         SUB  MAGTS
         SUB  SCSZ
         JPA  MAGIX  **DONT EXPAND
         LDA  B
         SUB  SCCEN+1
         FABVAL
         SUB  MAGTS
```

```
        SUB   SCSZ
        JPA   MAGIX   **DON'T EXPAND
MAGIGO→PUTNAME≡a→LMNAME
        SKN   SHOWINSASBOX
        JPQ   MAGIGOA
        **ENBOX INSTANCE
        SUMM≡LIST+IVALa→LIST+IVAL+1a=EXPAIRTS→BADOV
        DIFF≡LIST+IVALa→LIST+IVAL+1a=EXPAIRTT→BADOV
        SUMM→IP+1a= B→BADOV
        SUMM≡IPa→EXPAIRTS→BADOV
        ROTA→LMEND
        REX γ 3
MAGIASBOX→
        LDA   EXPAIRTS
        EXA   EXPAIRTT
        COM   A
        STA   EXPAIRTS
        LDAB≡LMEND
        STAB≡LMSTART
        SUMM≡IP+1a→EXPAIRTT = B→BADOV
        SUMM≡IPa→EXPAIRTS→BADOV
        ROTA→LMEND
        ♦JPQ  LMAG
        -1JPX γ MAGIASBOX
MAGIGOA→
        SKZ   SUPPINS
        JPQ   MAGIX
        RSX   γ|a LIST+IWHAT
        SXD   γ 0
        JPQ   MAGIX   **NO PIC TO SHOW
        ♦LDE  γ LIST+PSAVE
        1SED  ( 0)
        JPQ   *+2
        JPQ   MAGIX   **RECURSIVE PICTURE
        DPX   β|γ PSAVE+LIST
        MOVE|MAGIX→2 PSAVE+LISTγ
        REX   β 5
        LDA   β MATS
        STA   β|γ LIST+PSAVE+1
        -1JPX β *-2
MAGIGO1→
        LDAB≡IPa
        ♦JPQ  ROTATER
        STA   EXPAIRTS
        STB   EXPAIRTT
        DPX   MATRX
        DPX   MATRY
        LDAB≡LIST+IVALa
        COM   B
        ♦JPQ  ROTATER
```

```
------------------------------------------------
            IES   ONLW   024
      COM   B
      STA   MATM
      STB   MATO
      PRODEMATS×LIST+ISIZEB/MATD=MATS→BADOV
      MOVEILIST+PSIZEγ→MATO
MAGIGO2→
      MOVEIEXPAIRTS→MATRX
      MOVEIEXPAIRTT→MATRY
      REX β 1
      ADX β EXLEVEL
      MKN   EXPINS
      REX β|γ
      GORREPPART×β=α→MAGI→MAGILV
MAGILV→REX γ 5
      REX β|α
      LDA γ|β LIST+PSAVE+1
      STA γ MATS
      -1JPX γ#-2
      MOVEI2 LIST+PSAVEβ→1 MAGIX
      RSX γ EXLEVEL
      -1JPX γ#+2
      ERROR≡Y→MAGIX          **OUT TOO FAR
      DPX γ EXLEVEL
      SXD γ 0
      MKZ   EXPINS
      REX γ 0
      EXX γ|β LIST+PSAVE
      REX β|γ
MAGIX→ JPQ #
SIZER→ 1STE   SIZEX
      STA   ROTX
      STB   ROTY
      PRODEMATO×ROTY/MATD=ROTS→BADOV
      PRODEMATM×ROTX/MATD→BADOV
      SUB   ROTS
      #JOV   BADOV
      EXA   ROTX
      PROD×MATO/MATD=ROTS→BADOV
      PRODEMATM×ROTY/MATD→BADOV
      ADD   ROTS
      #JOV   BADOV
      STA   B
      LDA   ROTX
SIZEX→ JPQ #
ROTATER→
      1STE   ROTATX
      STA   ROTX
      STB   ROTY
      PROD×MATM/MATD=ROTS→BADOV
      PRODEROTY×MATO/MATD→BADOV
```

```
---------------------------------------
                IES   ONLW   025
      ADD   ROTS
      *JOV   BADOV
      ADD   MATRX
      *JOV   BADOV
      EXA   ROTX
      PROD*MATO/MATD=ROTS→BADOV
      PROD≡MATH*ROTY/MATD→BADOV
      SUB   ROTS
      *JOV   BADOV
      ADD   MATRY
      *JOV   BADOV
      STA   B
      LDA   ROTX
ROTATX→JPQ  *
WHERESUB→
      'STE   WHERESUBX
      S≡TYPE,*
      T≡VARLOC,S
      *LDE S TUPLE+LIST
      *'SED  ( 2)
      JPQ  *+5
      'SED  (  4)
      JPQ  *+2
      ERROR≡S→WHERESUBX
      INX T 2
      INX T|*
      LDAB≡LIST_T
WHERESUBX→
      JPQ  *
TRANSFORM→
      'STE   TRANSFORMX
      DPX * TRANSFORM*
      S≡TYPE,*
      AUX *|S LIST+VARLOC
      INX * LIST
      RSX S|S LIST+TUPLE
      JPQ  *+1
TRANSFORMB→
      'STE   TRANSFORMX
      DPX * TRANSFORM*
      SXD S 1
      JPQ   TRANS1
      SXD S 2
      JPQ   TRANS2
      SXD S 4
      JPQ   TRANS4
      ERROR≡S→TRANSFORMX1
TRANS1→LDA * 0
      MUL   MATS
      DIV   MATD
```

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```
-----------------------------------------------

                IES   ONLW   026
      *JOV  BADOV
      STA · 0
      JPQ   TRANSFORMX1
TRANS2→LDAB≡0·
      *JPQ  ROTATER
      STAB≡0·
      JPQ   TRANSFORMX1
TRANS4→LDAB≡2·          **POSITION
      *JPQ  ROTATER
      STAB≡2·
      PROD≡MATO×1·/MATD=ROTS→BADOV
      PROD≡MATM×0·/MATD→BADOV
      SUB  ROTS
      *JOV  BADOV
      EXA  0·
      PROD×MATO/MATD=ROTS→BADOV
      PROD≡MATM×1·/MATD→BADOV
      ADD  ROTS
      *JOV  BADOV
      STA  1·
TRANSFORMX1→
      RSX · TRANSFORM·
TRANSFORMX→
      JPQ *
ANGLEFIX→
      'STE  ANGFX
AF1→  DIREC≡AFST→AFCEN=AFTT→BADOV
      DIREC≡AFEND→AFCEN=AFTV→BADOV
      SUB  AFTT    **IGNORE OVERFLOW
      ADD  (0)
      SCA  (-1,)
      STA  AFTT    **RELATIVE ANGLE
      SUB  AFANG   **EXISTING ANGLE
      *JOV  AF1A
      FABVAL
      SUB  ( 200,0,,0,1)
      JNA  AF1B
AF1A→ MKC  4.9  AFTT
      LDA  AFTT
      SUB  AFANG
      *JOV  AFOVER
      FABVAL
      SUB  ( 200,0,,0,1)
      JNA  AF1B
AFOVER→LDA ( 377,-0,,-0,-0)
      LDB  AFANG
      SKZ  4.9  B
      COM  A
      JPQ  AF1B+1
AF1B→ LDA  AFTT
```

```
        STA   AFANG
ANGFX-  JPQ   *
AFEND-  0
        0
RI-     JPQ   377750
CL-     JPQ   200000
ST-     JPQ   200001
LAST-   ZZLAST
```

FIX (18 SEPT 62)

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```
HHL   APY8   001

*ADCEFF=014334
 ADCEQ=012253
-ADCON
 ADCONER=012166
 ADCONEX=012301
 ADCON1=012203
 ADCON1X=012300
 ADCON2=012211
*ADCONT1=014335
 ADCON2X=012264
 ADCON3=012331
*ADCONT2=014340
 ADCONSTEP=014300
 ADCON1XA=012275
 ADCSUB=012237
*ADCSE=014336
*ADCSUM=014337
*ADCVC=014333
 ADVC=012255
 BADOV
 BWHOS
 CCFR
 CCFR1=023775
 CHVAR
 CL=013300
 CLEAN=013115
 CLEANEX=013152
 CLEAN1=013153
 CLEAN1X=013157
 CLEAN2=013204
 CNST1=013000
 CNST2=013021
 CNST1X=013020
 CNST1A=013005
-COMBL
-COMBR
 COMP
 CONSTRAINTS
 CONSTART=012760
 CONSTARTX=013023
 CURPICS
 CVTS
 DESIGS
-DIFF
 DONE=012017
 ERRORSTOP
-ERROR
-ERROR1
 FIXEDS
-HDIF
-HSUM
 INSTANCES
 IP
 IPCI
 IPCONS
 IPCOTP
 IPCONCOMP=013215
 IPCONCOMP1=013246
 IPCONEX=013245
 IPCONEX1=013276
 IPCP
 IPCV
 ISIZE
 IVAL
 IWHAT
 LAST=013302
-LDAB
-LDAE
-LGORR
-LGORL
-LGORR1
-LGORL1
*LGORR1
*LGORR0
*LGORREND
*LGORR2
*LGORR11
*LGORR10
*LGORRIEND
*LGORRI2
*LGORL1
*LGORL0
*LGORLEND
*LGORL2
 LIST
 LPSTART=013024
 LPSTARTX=013030
-LTAKE
 MASBL
 MASTERS
-MOVE
-MOVEL
-MOVER
 MOVIT
 MOVINGS
 NAME
 NCON
 NEWCONS
*ROTS=014346
 S
*SLVAD
*SLVAD6
*SLVAD1
*SLVAD4
*SLVAD1+5
*SLVAD2
*SLVAD3
*SLVAD8
*SLVAD5
*SLVAD7
*SLVAD9
*SLVDR
*SLVD1
*SLVD3
*SLVD2
*SLVD6
*SLVR1
*SLVR2
*SLVR5
*SLVR3
*SLVR4
*SLVR6
*SLVT3
*SLVT5
*SLVTR
*SLVTR2
*SLVT6
*SLVT2
*SLVTX
*SLVT4
*SLVTS
*SLVTP
*SLVTY
*SLVTP2
 SMASBL
-SOLVE
-SOLVEM
-SOLVEM1
*SOLVX
 SPECB
 ST=013301
-STAB
-STAE
 STARTS=012000
 STARTS1=012020
 STARTS1X=012053
-SUBR
```

```
--------------------------------------------------------

                HHL   APY5   002

FIXSAP=200064       *NEWCON=014343          *SUBR1
*FRSC=014341        =NORMATH                =SUMM
FRCC=012370         =NORMAT                  T
FREES               *NORT4                  *T1
FREEDOMS            *NORT1                  *T2
FREESUB=012302      *NORT2                   TOPOS
FREESUBX=012306     *NORT3                   TUPLE
*FREESUB0=014342    *NORX                    TYPE
FREESUB1=012323     *NORX1                   VA
FREESUB2=012356      ORDSLV=013031           VARIABLES
FREESUB1X=012355     ORDSLVX=013066          VARLOC
FREESUB1B=012332     ORDSLV1=013067          VCON
FREESUB1A=012347     ORIGIN                  VFLW
FREESUB3=012365     *OVERRELAXFAC=014344     VORD
FREESUBFREE=012361   PICBLKS                 WORKS
FREESUB4=012373      PICTURES                WORKER=012616
FREESUB7=012457      POINTS                  WORKEX=012757
FREESUB5=012416      PPART                   WRK1A=012654
FREESUB6=012431     =PROD                    WRK1=012662
FREESUB5X=012430     PSIZE                   WRK1AX=012661
FREESUB5A=012425    =PUTL                    WRK2=012701
FREESUB8=012475     =PUTR                    WRK2X=012705
FREEDOM=012507       PVAL                    WRK3=012706
FREEDOMX=012615      REANS                   WRK4=012724
FREE1BAC=012525      REEQ                    WRK4X=012756
FREE1A=012551        RELA=012054             WRK5=012742
FREE1=012534        *RELAXTHIS=014345       *ZZLAST=014347
FREE2=012554         RELB=012105             Y
FREE3=012573         RELBX=012111            Z1
FREE3X=012614        RELC=012112             Z2
=GOAC                RELC1=012133            Z3
*GORLEXIT            RELC2=012154            71
*GORREXIT            RELX=012165             0
*GORRIEXIT           RI=013277               4
                                             6
```

```
------------------------------------------

            HHL   APY8   003

 BADOV= 200100                            =     200100
 BWHOS= 4     **TO WHICH PICTURE BLOCK BELONGS
                                          =          4

 CVTS= 6      ** VARIABLE TO MOVE TO SATISFY THIS
                                          =          6
 COMP= 16     **CONSTRAINT COMPUTATION ROUTINE
                                          =         16
 CHVAR= 20    **# CHANGABLE VARIABLES     =         20
 CURPICS= 15*SMASBL+LIST+1                =      24117
 CONSTRAINTS= 4*SMASBL+LIST+1             =      24031
 CCFR= LIST-2                             =      23776

 DESIGS= 13*SMASBL+LIST+1                 =      24103

 ERRORSTOP=SKM 4.10 377730                = 1712377730

 FREES= 5*SMASBL+LIST+1                   =      24037
 FREEDOMS= 6*SMASBL+LIST+1                =      24045
 FIXEDS= 12*SMASBL+LIST+1                 =      24075

*GORREXIT= CLEANIX                        =      13157
*GORRIEXIT= WORKEX                        =      12757
*GORLEXIT= 0                              =          0

 IWHAT= 14    ** WHAT PIC THIS IS INSTANCE OF
                                          =         14
 INSTANCES= 6*MASBL+PICTURES              =      24345
 IPCP= 10     **POINT IN INSTANCE-POINT CONSTRAINT
                                          =         10
 IPCI= 12     ** INSTANCE IN INSTANCE-POINT CONSTRAIN
                        T                 =         12
 IPCV= 14     ** VIRGIN POINT IN INSTANCE-POINT CONST
                        RAINT             =         14
 IPCONS= 11*MASBL+PICTURES                =      24441
 IVAL= 20     ** R COS 0, R SIN 0, X, Y   =         20
 IP= IVAL+LIST+2    ** INSTANCE POSITION  =      24022
 IPCOTP= 16   ** INSTANCE-POINT CONSTRAINTS WITH THIS
                        VIRGIN            =         16
 ISIZE= 16    ** R                        =         16

 LIST= 24000 **LIST STRUCTURE START       =      24000
 LGORR1=                                  =      11366
 LGORR0=                                  =      11362
 LGORREND=                                =      11374
 LGORR2=                                  =      11372
 LGORRI1=                                 =      11366
 LGORRI0=                                 =      11363
 LGORRIEND=                               =      11376
 GORRI2=                                  =      11373
```

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----------------------------------------------------------------

              HHL   APY8   004

 *LGORL1=                                      =      11366
 *LGORL0=                                      =      11367
 *LGORLEND=                                    =      11374
 *LGORL2=                                      =      11373

 MASBL= 24    **MASTER BLOCK LENGTH            =         24
 MASTERS= LIST+1                               =      24001
 MOVIT= 10    **HOW TO MOVE COORDINATES        =         10
 MOVINGS= 14*SMASBL+LIST+1                     =      24111

 NCON= 17     **# CONSTRAINTS SHOWN            =         17
 NAME= 4      **NAME OF HEADER BLOCKS          =          4
 NEWCONS= 16*SMASBL+LIST+1                     =      24125
*NORT4=                                        =      11426
*NORT1=                                        =      11371
*NORT2=                                        =      11422
*NORT3=                                        =      11423
*NORX=                                         =      11410
*NORX1=                                        =      11416

 ORIGIN= 12000                                 =      12000

 PICTURES= 22*SMASBL+LIST+1                    =      24155
 PVAL= 20     ** COORDINATES OF POINT          =         20
 POINTS= 4*MASBL+PICTURES                      =      24275
 PPART= 4     **PICTURE PARTS                  =          4
 PSIZE= 16    **SIZE OF THIS PICTURE           =         16
 PICBLKS= 2   **NON PICTURE STUFF IN PICTURE
                                               =          2

 REEQ= 140                                     =        140
 REANS= 100                                    =        100

 SMASBL= 6    **SMALL MASTER BLOCK LENGTH FOR DESIGNA
                         TERS                  =          6
 S= 7                                          =          7
 SPECB= 2     **SPECIFIC BLOCKS                =          2
*SLVDR=                                        =      11551
*SLVT3=                                        =      11403
*SLVT5=                                        =      11413
*SLVTR=                                        =      11504
*SLVTR2=                                       =      11463
*SLVT6=                                        =      11415
*SLVT2=                                        =      11377
*SLVTX=                                        =      11470
*SLVT4=                                        =      11407
*SLVTS=                                        =      11472
*SLVR1=                                        =      11423
*SLVTP=                                        =      11506
*SLVR2=                                        =      11437
```

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              HHL   APY5   005

 *SLVR5 =                                 =      11512
 *SLVTY =                                 =      11471
 *SLVR3 =                                 =      11440
 *SLVR4 =                                 =      11475
 *SLVR6 =                                 =      11473
 *SLVTP2 =                                =      11461
 *SLVAD =                                 =      11571
 *SLVD1 =                                 =      11535
 *SLVD3 =                                 =      11557
 *SLVD2 =                                 =      11541
 *SLVD6 =                                 =      11552
 *SLVAD6 =                                =      11635
 *SLVAD1 =                                =      11576
 *SLVAD4 =                                =      11621
 *SLVAD1.5=                               =      11603
 *SLVAD2 =                                =      11606
 *SLVAD3 =                                =      11616
 *SLVAD8 =                                =      11654
 *SLVAD5 =                                =      11626
 *SLVAD7 =                                =      11643
 *SLVAD9 =                                =      11660
 *SOLVX =                                 =      11404
 *SUBR1 =                                 =      11370

  TYPE= 0       **TIES TO SPECB IN MASTER BLOCK
                                          =          0
  T= 10                                   =         10
  TUPLE= 14     ** # VARIABLES            =         14
  TOPOS= 3*SMASBL+LIST+1                  =      24023
 *T1=                                     =      11366
 *T2=                                     =      11373

  VA= PVAL+LIST                           =      24020
  VORD= 6       **ORDERING OF VARIABLES   =          6
  VFLW= 10      ** CONSTRAINTS WHICH THIS VARIABLE IS T
                             O SATISFY    =         10
  VCON= 12      ** CONSTRAINTS ON THIS VARIABLE
                                          =         12
  VARLOC= 15   **LOCATION OF VARIABLES IN BLOCK
                                          =         15
  VARIABLES= 1*SMASBL+LIST+1              =      24007

  WORKS= 7*SMASBL+LIST+1                  =      24053

  Y= 3                                    =          3

 #1= 11                                   =         11
 #2= 12                                   =         12
 #3= 13                                   =         13
```

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HHL APYS 006

71= 14 = 14

0= 1 = 1

A= 4 = 4

D= 3 = 3

```
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

                    HHL  APYS  007

▾▾DEF  PROD#A*B/C=D→E
LDA A
MUL B
DIV C
*JOV E
STA D
▾▾END

▾▾DEF  SUMM#A→B=C→D
LDA A
ADD B
*JOV D
STA C
▾▾END

▾▾DEF  DIFF#A→B=C→D
LDA A
SUB B
*JOV D
STA C
▾▾END

▾▾DEF  NORMATM
'STE NORT4      ** 50 (NM+4)
REX,1|,1'
'DPX,1NORT1
'DPX,1NORT2-3
'DPX,1NORT2-1
RSX,1*NORT3
DEX,1'
DPX NORX
STA NORX1
NORT1→ LDA,1   **FIND |MAX|
JPA #+2
COM A
SUB NORX
JNA #+3
ADD NORX
STA NORX
-1 JPX,1NORT1
11 LDA,1
SAB (-35.,)
15 DIV ,1        **N
LDE NORX1
18 SED,1
18 LDA,1         **M
MUL NORX         **NEW MAX
*NAB (35.,)
STD NORX
COM NORX
```

```
HHL  APY8 — 010

RSX,1*NORT3
JPQ NORT2
NORX→ 0
NORX1→ 0
LDA,1  **P+1
SCA NORX
STA,1  **P+1
NORT2→ -1 JPX,1 0-3
NORT3→ LDA,1
12 SUB NORX     **OVF?
12 STA,1        **NEW EXP
NORT4→ JPQ 0
***
--END

--DEF  NORMAT|P,M
REX,1*(P)
18 LDA,1 -M+M
*JPQ (NORMATM)
--END

--DEF  HSUM#A→B=C
LDA A
ADD B
SCA (-1,)
STA C
--END

--DEF  MOVE|A→B
*LDE A
STE B
--END

--DEF  HDIF|P,Q→R
LDA P
SUB Q
SCA (-1,)
STA R
--END

--DEF  LDAE#P,Q,R,S
LDA P
LDB P+Q
LDC P+R
LDD P+S
--END

--DEF  STAE#P,Q,R,S
STA P
STB P+Q
```

```
------------------------------------------------------------

                    HHL   APY8   *11

STC P+R
STD P+S
--END

--DEF  LDAB#P
LDA P
LDB P+1
--END

--DEF  STAB#P
STA P
STB P+1
--END

--DEF  ERROR#*->P
*JP0 (ERROR1#*->P)
--END

--DEF  ERROR1#*->P
'STE *+2
SKZ ERRORSTOP
'#*
JP0 P
--END

--DEF  SOLVE|P->Q
REX#1*(P)
REX#2*(Q)
*'*LDE #1*
      *SED (2)
      JP0 *+12
*SED (3)
JP0 *+6
*SED. (5)
JP0 *+2
*
*JP0 (SOLVEM|4)
JP0 *+4
*JP0 (SOLVEM|2)
      JP0 *+2
      *JP0 (SOLVEM1)
--END

--DEF  ADCON#C->P
OPX_CA
*DPX_PA
*JP0 ADCONER
-END

-DEF  *[]A*B*C*D*E*F*G*H*I,*
```

```
+---------------------------------------------------
                    HHL    APY8    0 1 8
REX8*(08)
RSX8*(LIST+I8)+(IA(370,))
RSX8*(LIST+H8)+(HA(370,))
RSX8*(LIST+G8)+(GA(370,))
RSX8*(LIST+F8)+(FA(370,))
RSX8*(LIST+E8)+(EA(370,))
RSX8*(LIST+D8)+(DA(370,))
RSX8*(LIST+C8)+(CA(370,))
RSX8*(LIST+B8)+(BA(370,))
RSX8*(LIST+A8)+(AA(370,))
--END

--DEF  LTAKE≡N×XR
        12RSXS|XRLIST+(N)+1
        11RSXT|XRLIST+(N)+1
        1DPXT|SLIST
        2EXXS|TLIST
        1DPXS|XRLIST+(N)+1
        2DPXS|XRLIST+(N)+1
        1DPX0|XRLIST+(N)
--END

--DEF  PUTL≡N×XR→M×XR2
        12AUXXR((N)+1,,-((N)+1))
        12RSXS|XR2LIST+(M)+1
        2DPXS|XRLIST
        11RSXT|SLIST
        1DPXT|XRLIST
        2DPXXR|TLIST
        1DPXXR|SLIST
        11RSXS|XR2LIST+(M)
        8JPXS*+2
        SKXS|XR20
        1DPXS|XRLIST-1
        11AUXXR((N)+1,,-((N)+1))
--END

--DEF  MOVEL≡N×XR→M×XR2
        12RSXS|XRLIST+(N)+1 ** TAKE
        11RSXT|XRLIST+(N)+1
        1DPXT|SLIST
        2EXXS|TLIST
        1DPXS|XRLIST+(N)+1
        2EXXS|XR2LIST+(M)+1 ** PUT
        2DPXS|XRLIST+(N)+1
        11RSXT|SLIST
        1EXXT|XRLIST+(N)+1
        1DPXT|SLIST
--END
```

```
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                HHL   APY1   011

--DEF  PUTR1N*XR-M*XR1
        12AUXXR(1N)+1,,-((N)+1))
        11RSXS|XR1LIST+(M)+1
        1DPXS|XRLIST
        12RSXT|SLIST
        2DPXT|XRLIST
        2DPXXR|SLIST
        1DPXXR|TLIST
        11RSXS|XR1LIST+(M)
        1JPXS#+1
        SKXS|XR1°
        1DPXS|XRLIST-1
        11AUXXR(1N)+1.,-((N)+1))
--END

--DEF  MOVER1N*XR-M*XR1
        12RSXS|XRLIST+(N)+1 **TAKE
        11RSXT|XRLIST+(N)+1
        1DPXT|SLIST
        2EXXS|TLIST
        2DPXS|XRLIST+(N)+1
        1EXXS|XR1LIST+(M)+1 **PUT
        1DPXS|XRLIST+(N)+1
        12RSXT|SLIST
        2EXXT|XRLIST+(N)+1
        2DPXT|SLIST
--END

--DEF  COMBL1N*XR-M*XR1
        12RSXS|XRLIST+(N)+1
        2EXXS|XR1LIST+(M)+1
        11RSXT|XRLIST+(N)+1
        2DPXS|TLIST
        1EXXT|SLIST
        12RSXS|XRLIST+(N)+1
        1EXXT|SLIST
        2DPXT|XRLIST+(N)+1
        1DPXT|XRLIST+(N)+1
END

DEF  COMBR1N*XR-M*XR1
        11RSXS|XRLIST+(N)+1
        1EXXS|XR1LIST+(M)+1
        12RSXT|XRLIST+(N)+1
        1DPXS|TLIST
        2EXXT|SLIST
        11RSXS|XRLIST+(N)+1
        2EXXT|SLIST
        2DPXT|XRLIST+(N)+1
```

```
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
                    HHL   APY5   014
**END

**DEF  LGORR=N*XR=XR2-SUBR-LEXIT
GORREXIT=LEXIT
        1DPX XR LGORR1
        11RSX XR2|XR LIST+(N)+1
LGORR0-        16RSX XR|XR2 LIST-1
        0-1JNX XR 0+2
        1SKX XR 1
        IN X XR|XR2 0
LGORR1-        SXD XR 0 **MODIFIED
        0JPQ GORREXIT+(GORREXIT/GORREXIT@1=(LGORREND+
                                   1))
        11RSX XR2|XR2 LIST
        1DPX XR2 LGORR2
        0JPQ SUBR
LGORR2-        SKX XR2 0          **MODIFIED
LGORREND-      JPQ LGORR0
**END

**DEF  LGORL=N*XR=XR2-SUBR-LEXIT
GORLEXIT=LEXIT
        1DPX XR LGORL1
        11RSX XR2|XR LIST+(N)+1
LGORL0-        16RSX XR|XR2 LIST-1
        0-1JNX XR 0+2
        1SKX XR 1
        IN X XR|XR2 0
LGORL1-        SXD XR 0 **MODIFIED
        0JPQ GORLEXIT+(GORLEXIT/GORLEXIT@1=(LGORLEND+
                                   1))
        11RSX XR2|XR2 LIST
        1DPX XR2 LGORL2
        0JPQ SUBR
LGORL2-        SKX XR2 0          **MODIFIED
LGORLEND-      JPQ LGORL0
**END

**DEF  LGORRI=N*XR=XR2-SUBR-LEXIT
GORRIEXIT=LEXIT
        1DPX XR LGORRI1
        11RSX XR2|XR LIST+(N)+1
LGORRI0-       16RSX XR|XR2 LIST-1
        0-1JNX XR 0+2
        1SKX XR 1
        IN X XR|XR2 0
LGORRI1-       SXD XR 0 **MODIFIED
        0JPQ GORRIEXIT+(GORRIEXIT/GORRIEXIT@1=(LGORRI
                                 END+1))
        1DPX XR2 LGORRI2
```

```
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

                    HHL   APY1   012

        12RSX XR2|XR2 LIST      **CURRENT NEXT
        •JP@ SUBR
LGORRI2→     SK X XR2 #         **MODIFIED
        12RSX XR2|XR2 LIST      **NEW NXT
LGORRIEND→   JP@ LGORRI0
••END


••DEF  LGORLI#N×XR=XR2→SUBR→LEXIT
GORLIEXIT=LEXIT
        1DPX XR LGORLI1
        12RSX XR2|XR LIST+(N)+1
LGORLI0→       15RSX XR|XR2 LIST-1
        •-1JNX XR #+2
        1SKX XR 1
        IN X XR|XR2 0
LGORLI1→     SXD XR # **MODIFIED
        •JP@ GORLIEXIT+(GORLIEXIT/GORLIEXIT⊘1×(LGORLI
                                  END+1))
        1DPX XR2 LGORLI2
        12RSX XR2|XR2 LIST      **CURRENT NXT
        •JP@ SUBR
LGORLI2→     SK X XR2 #         **MODIFIED
        12RSX XR2|XR2 LIST      **NEW NXT
LGORLIEND→   JP@ LGORLI0
••END


••DEF  GOAC#C→R→S
        1DPX C T1+1
        RSX C|C LIST+TYPE
        RSX C|C LIST+CHVAR
        IN X C|C
        JP@ T2
        •
T1→     DP X C T1-1
        IN X C #
        RSX C|C LIST+CVTS+2
        •JP@ R
        RSX C T1-1
T2→     -2JPX C T1
        RSX C T1+1
        JP@ S
••END


••DEF  SUBR#A
        1STE SUBR1
        A
SUBR1→ JP@ #
••END


••DEF  SOLVE#|K
```

```
        1STE SLVDR
        NORMAT
        REX y1,(K+1)*K
        INX z1,1
        1DPX z1,SLVT3
        1DPX z1,SLVT3+1
        1DPX z2,SLVT5-1
        INX z2,(K+1)*(K-1)+1
        1DPX z2,SLVTR
        1DPX z2,SLVTR2
        1STA SLVT5      **N(K+1)
        1SUB SLVT8
        1STA SLVT5+1 **N(K+1)-1
        1STA SLVT2+1
        RSX z2,A
SLVT2-  DEX z2,1
        REX z1   **N(K+1)-1
        REX z3,K
        DPX SLVTX
SLVT3-  LDA z1   **SQUARE
        MUL z2
        DEX z1,K
        DEX z2,K+1
SLVT4-  ADD SLVTX
        STA SLVTX
        -1 JPX z1,SLVT3
        STA y1
SLVT5-  INX z2   **N(K+1)
        INX z1   **N(K+1)-1
SLVT6-  DEX y1,1
        -1 JPX z3,SLVT3-1
        JPX y1,SLVT2
        DPX SLVTS
        1REX z3,K+1
        REX z1,K-1
SLVR1-  RSX z2,SLVT5-1
        INX z2,(K+1)*(K-1)+1
        1DPX z2,SLVTP
        REX z2,K-1
        REX y1,0
        LDA z1,*SLVTR
        JPA SLVR2
        COM A
        JPA SLVR2
        1REX y1,1          **SINGULAR
        1ADX y1,SLVTS
        JPO SLVR5+8
SLVR2-  STA SLVTY
SLVR3-  SXD z1|z8
        JPO SLVR5+2
```

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HHL APY8 017

```
        LDA,1*SLVTP
        JPA *+4
        COM A
        JPA *+7
        JPQ SLVR5
        SUB SLVTY
        JNA SLVR4
        LDA,1*SLVTR  **PR MAX
        DIV,1*SLVTP
        JOV SLVR6
        STA SLVTX
        LDA SLVTP
        1STA SLVTR2+2
        1STA SLVTP2
        REX,1K
SLVTP2-         LDA,1  **LOOP1
        MUL SLVTX
SLVTR2-         SUB,1
        SCA (-1.)
        STA,1
        -1 JPX,1SLVTP2
        JPQ SLVR5
SLVTX- 0
SLVTY- 0
SLVTS- 0
SLVR6- COM A
        JPQ SLVTP2-5
SLVR4- LDA,1*SLVTP  **RR MAX
        DIV,1*SLVTR
        COM A
        STA SLVTX
        LDA SLVTP
        1STA SLVTP+2
        REX,1K
SLVTR- LDA,1  **LOOP 2
        MUL SLVTX
SLVTP- ADD,1
        SCA (-1.)
        STA,1
        -1 JPX,1SLVTR
SLVR5- REX,1|X1
        DPX *SLVTP
        REX,1,0
        1ADX,2SLVTP
        -1 JPX,2SLVR3
        1ADX,2SLVTR
        1ADX,2SLVTR2
        -1 JPX,2SLVR1
        LDA (K+1.,(K+1)*K)
        RSX,2SLVT8-1
```

```
                HHL   APY8   020

        STA x1
        11 LDA  SLVTS
        JNA SLVAD      ** TO ADD CONSTRAINTS
        OPX SLVTX
        LDA(1..K)
        STA x3
        REX x2|x3 1
        INX x2 (K+1)*(K-1)
        REX x1 K-1
SLVD1-  LDA x2 K
        SAB SLVTX
        DIV x1|x2
        JOV SLVD3
SLVD2-  STA x1|x3 K+1*K+1        ** FINAL ANSWER
        DEX x2 K+1
        -1 JPX x1 SLVD1
        REX x1 K-1
        LDA x1|x3 K+1*K+1
        STA x1|x3 1
        -1 JPX x1 *-2
        12 LDA  SLVTS  ** OLD DEGENERACY
SLVOR-  JPQ *
SLVD6-  1 REX y1 1
        1 ADX y1 SLVTS
        OPX A
        STA x1|x2
        JPQ SLVAD
SLVD3-  OPX A
        ADD x2 K
        SAB (-35.,)
        DIV x1|x2
        JOV SLVD6
        *NOA (35.,)
        *32 STD x3
        32 STD  SLVTX
        COM SLVTX
        JPQ SLVD1-3
SLVAD-  REX x1 K-1           ** COUNT DIAG
        RSX y1 SLVTS-1 ** MATRIX LOCATION
        DEX y1 K
        1 DPX y1 SLVAD8+1          ** TO GET POINT VALUE
        INX y1 (K+1)*K ** Y1 AT LAST ROW
SLVAD1-       LDA x1|y1          ** DIAGONAL
        JPA SLVAD4
        JNA SLVAD4
        LDA (100.,)
        STA y1 K ** PUT FUTURE DIAG IN CONSTANT
SLVAD1.5-     REX x2 K-1         ** COUNT COLUMNS
        RSX x3 SLVTS-1 ** MATRIX LOCATION
        INX x3 (K-1)*(K+1)+1
```

```
------------------------------------------------------------
                    HHL   APY8   021
SLVAD2-        LDA,2|X3        **DIAGONAL
     JPA *+3
     JNA *+2
     JPQ SLVAD3.    **SKIP DEGEN EQUATIONS
     LDA,1|X3       **NEXT NON REDUCED TERM
     MUL,1,K **FUTURE DIAG IN CONSTANT
     DIV,2|X3       **DIAGONAL
     JOV SLVAD8
SLVAD3-        STA,2|Y1        **EQUATION ENTRY MAY BE ZE
                               RO
     DEX,3K+1
     -1 JPX,2,SLVAD2
SLVAD4-        DEX,1K+1
     -1 JPX,1,SLVAD1
     SEX,1K-1       **MAKE COMPLETE EQUATIONS
     RSX,3SLVT8-1 **COUNT ROWS
     INX,3(K-1)*(K+1)+1
SLVAD5-        LDA,1|X3        **DIAGONAL
     JPA SLVAD7
     JNA SLVAD7
     EXA,3K **CLEAR CONSTANT, GET DIAGONAL
CON A
     STA,1|X3       **PUT IN DIAGONAL
     REX,1K-1
SLVAD6-        LDA,1|X3
     MUL,1,* **SET TO MATRIX-K
     ADD,3K **CONSTANT
     JOV SLVAD9
     STA,3K
     -1 JPX,1,SLVAD6
SLVAD7-        DEX,3K+1
     -1 JPX,1,SLVAD5
     RSX,2SLVT8-1 **RETURN TO SOLVE
     INX,2(K-1)*(K+1)+1
     1DPX,2,SLVTR
     1DPX,2SLVTR2
     11LDA SLVT8
     17STA SLVT8
     JPQ SLVR1-2
SLVAD8-        LDB,1K **OVERFLOW IN MAKING TERMS
     SCB (-2,)
     STB,1K
     JPQ SLVAD1-5 **MAKE TERMS AGAIN
SLVAD9-        SCA (-2,)       **OVERFLOW IN FIGURING CON
                               STANT
     REX,2K-1
     LDB,2|X3       **REDUCE ALL TERMS
     SCB (-2,)
     STB,2|X3
     -1 JPX,2*-3
```

```
--------------------------------------------------------

                  HHL   APYS   #22
         JPQ SLVAD7-#
**END


**DEF    SOLVEN1
         'STE SOLVX
         NORMAT
         DPX B
         DPX A
         RSX x3|x1
         INX x1 1
         'DPX x1 #+2
         JPQ #+5
         ADD x3 #
         EXA B
         -1 JPX x3 #-2
         STB C
         1# LDB A
         SCB (-#.,)
         DIV C
         #JOV BADOV
         #LDE (1.,1)
         STE x2 0
         STA x2 1
         DPX A
SOLVX→   JPQ #
**END
```

```
------------------------------------------------------------
                HHL   APY8   023

200060|
        ¤JMP   STARTS                  |400500 012000|200060

200061|
        ¤JPQ   CONSTART                |540500 012760|   063
FIXSAP→¤JMP   LPSTART                 |400500 013024|   064
 CCFR-1|
CCFR1→ ¤JMP   IPCONCOMP               |400500 013215|   776
        ¤JMP   IPCONCOMP1              |400500 013246|   776
 ORIGIN|
```

```
----------------------------------------------

                    HHL   APY1   #01

STARTS→¹STE   DONE
        REX  ,  CURPICS-LIST
        LGORR#SPECB*#=S→STARTS1
DONE→   JPQ  #
STARTS1→
        ¹STE   STARTS1X
        LGORR#PPART*#=S→RELA
        LGORR#PICBLKS*#=S→RELA
STARTS1X→
        JPQ  #
RELA→   ¹STE   RELX
        RSX  y|#  LIST+VORD
        SXD  y  FIXEDS-LIST
        JPQ   RELX
        RSX  y|#  LIST+TYPE
        RSX  y|y  LIST+TUPLE
        SXD  y  #
        JPQ   RELX      ** NOT A VARIABLE
        DPX   REEQ
        INX  y  1
        ³DPX  y  REEQ
        DPX  ,  RELAXTHIS        ** VARIABLE
        LGORR#VCON*#=S→RELB→RELC
RELB→   ¹STE   RELBX
        ²²LDA   RELAXTHIS
        ¹DPX  ,  A
        #JPQ   ADCONER
RELBX→  JPQ  #
RELC→   RSX  y  REEQ
        SXD  y  0
        JPQ   RELX
        y▯TUPLE*TYPE.#
        #▯VARLOC*TYPE.#
        INX  #|#
        LDA  (-REANS)
        ADX  y  A
        COM   A
        ¹STA   RELC1
        ¹DPX  y  RELC2
        JPQ  #+3
        LDA  y|#  LIST
RELC1→  STA  y#            ** SET TO REANS-K
        -¹JPX  y#-2
        SOLVE|REEQ→REANS
RELC2→  REX  y#            ** [illegible]
        JPQ  #+7
        LDA  y  REANS+1
        SUB  y|#  LIST
        #JOV   BADOV
        MUL   OVERRELAXFAC
```

```
--------------------------------------------
              HHL   APY1   002
      ADD  Y REANS+1
      STA  Y|0 LIST
      -1JPX  Y*-6
RELX→ JPQ  *
      **ADD CONSTRAINT TO VARIABLE
ADCONER→
      1STE   ADCONEX
      STA   ADCVC  **VARIABLE..CONSTRAINT
      RSX  S A
      RSX  T|S LIST+TYPE  **T=TYPE CONST
      RSX  T|T LIST+CHVAR ** # CHANGABLE VARIABLES
      INX  T|T
      JPQ  *+4
      *2LDE   ADCVC
      1SED  T|S LIST+CVTS+1        ** IS VAR CHANGABLE
      JPQ   ADCON1
      -2JPX  T*-1
      LDA  ( 0)
      JPQ   ADCONEX
ADCON1→DPX   ADCEFF  **EFFECT
      RSX  S|S LIST+TYPE  **S=TYPE CONST
      MOVEILIST+COMPS→1 ADCSUB
      RSX  T|S LIST+NCON
      JPQ   ADCON1X
ADCON2→DPX  T ADCONT1
      RSX  0 ADCVC
      *JPQ *ADCSUB
      STA   ADCSE   **STANDARD ERROR
      MUL  (-200,-0,,-0)
      STA   ADCSUM  **SUM FOR CONSTANT                S.E
      2RSX  S ADCVC
      RSX  T|S LIST+TYPE
      AUX  S|T LIST+VARLOC        **S POINTS TO VECTOR

      INX  S LIST
      1DPX  S ADVC  **ACTUAL VARIABLE LOCATION
      RSX  T|T LIST+TUPLE              T IS # OF VARIABLES
      RSX  S REEQ
      INX  S REEQ+1
      1DPX  S ADCEQ**LOCATION IN REEQ
      JPQ   ADCON2X
ADCON3→DPX  T ADCONT2
      LDA  *ADVC
      ADD  (ADCONSTEP→.100)
      *JOV   BADOV
      STA  *ADVC
      RSX  0 ADCVC
ADCSUB→*JPQ *
      SUB   ADCSE   **STANDARD ERROR
      SCA  (-1,)
```

HHL APY8 003

```
        1ᴱLDB  A
        SCB  (-9.,)
        DIV  ADCONSTEP
        *JOV  BADOV
        JPA  *+3
        JNA  *+2
        JPQ  *+2
        MKN  4.,1  ADCEFF
        RSX  T  ADCONT2
ADCEQ→  STA  T*                  ** PLACE IN REEQ
        STA  B
ADVC→   LDA  T*
        SUB  ADCONSTEP
        STA  *ADVC
        MUL  B
        ADD  ADCSUM
        *JOV  BADOV
        STA  ADCSUM
ADCON2X→
        -1JPX  T  ADCON2
        SKN  4.,1  ADCEFF
        JPQ  ADCON1XA
        REX  T  1
        1ADX  T  ADCEFF
        RSX  T  REEQ
        1ᴱAUX  T  REEQ
        1DPX  T  REEQ
        STA  T  REEQ              ** PUT IN CONSTANT
ADCON1XA→
        REX  T  1
        ADX  T  ADCSUB
        RSX  T  ADCONT1
ADCON1X→
        -1JPX  T  ADCON2
ADCONEX→
        JPQ  *
        **SKIP IF * FREE
FREESUB→
        1STE  FREESUBX
        1DPX  FRCC  **CONSTRAINT COUNT
        1DPX  FRBC  **BLOCK COUNT
        1DPX  *  FREESUB*
        LGORR#VCON**=S→FREESUB1→FREESUB2
FREESUB1→
        1STE  FREESUB1X
        *LDE  *  LIST+CVTS
        *1SED  (*)
        JPQ  FREESUB1B
        1SED  FREESUB*
        JPQ  FREESUB1A
```

```
        JPQ   FREESUB;X
FREESUB;B-
        RSX , FREESUB*
        PUT L=CVTS*=-VFLW*B
FREESUB;A-
        REX  S '
        'ADX  S  FRBC
        S≡N CON*TYPE,*
        'ADX  S  FRCC
FREESUB;X-
        JPQ  *
FREESUB;-
        RSX  S FRCC
        SXL  S '
        JPQ   FREESUB;
FREESUBFREE-
        SUMM=( ;)-' FREESUB X=' FREESUBX
        JPQ   FREESUBX
FREESUB;-
        S≡TUPLE*TYPE,*
FRCC-   SXL  S*          *** CONSTRAINTS
        JPQ   FREESUB*
        JPQ   FREESUB'
FREESUB*-
        *LDE   FRBC
        SED  ( ;)
        JPQ   FREESUBFREE
        DPX   REEQ
        INX  S '         **TUPLE+1
        'DPX  S  REEQ
        LGORR=VCON**=S-FREE SUB;-FREESUB*
FREESUB;-
        'STE   FREESUB;X
        *LDE ,  LIST+CVTS
        *'SED  ( *)
        JPQ   FREESUB;A
        'SED   FREESUB*
        JPQ   FREESUB;A
        JPQ   FREESUB;X
FREESUB;A-
        ''LDA   FREE SUB*     **POINT
        'DPX , A ,     **CONSTRAINT
        *JPQ   ADCONER
FREESUB;X-
        JPQ  *
FREESUB*-
        SOLVE;REEQ-REANS
        S≡TYPE,*
        ADD  S  TUPLE+LIST     **K-DEGEN
        ''SUB   FRCC
```

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```
-----------------------------------------------------------
              HHL   APYS   ***
        JPA   FREESUB7
        JNA   FREESUB7
        JPQ   FREESUBFREE
FREESUB7-
        RSX * FREESUB*
        LGORR*VFLW***S-FREESUB*-FREESUBX
FREESUB*-
        SUBR*(LTAKE*CVTS**)
FREESUBX-
        JPQ *
        *** FOUND FREE, EXPAND FREEDOM
FREEDOM-
        'STE  FREEDOMX
        REX * FREEDOMS-LIST
        MOVEL*VORD***-SPECB**
        'DPX *|* LIST+VORD
        REX S|* VORD+1        **GO ON AROUND
FREE1BAC-
        *LDE S LIST-1         **FREEDOM RING
        *'SED ( *)   **TO KEY
        JPQ  FREEDOMX
        ''RSX * E
        INX *|S
        DEX * 1
        'DPX S FREE1A
FREE1- LGORR*VFLW***S-FREE*
FREE1A-REX S*
        ''RSX SIS LIST
        JPQ  FREE1BAC
FREE*- SUBR*(GOAC**-FREE3)
FREE3- 'STE  FREE3X
        RSX SI* LIST+VORD
        SXD S WORKS-LIST
        *JPQ  FREESUB
        JPQ  FREE3X
        REX * FREEDOMS-LIST
        MOVEL*VORD***-SPECB**
        'DPX *|* LIST+VORD
FREE3X-JPQ *
FREEDOMX-
        JPQ *
        **WORKING VARIABLE INCREASE
WORKER-'STE  WORKEX
        REX * MOVINGS-LIST
        LGORR*SPECB***S-WRK1A
        REX * WORKS-LIST
        LGORR1*SPECB***S-WRK1-WORKEX
WRK1A- 'STE  WRK1AX
        RSX SI* LIST+TYPE
        RSX SIS LIST+TYPE
```

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```
            HHL   APT#   ***
        SXD  S VARIABLES-LIST
        *JP0   WRK1
WRK1AX- JP0 *
WRK1-   SUBR#(LGORR#VCON**# S-WRK2)
WRK2-   'STE   WRK2X
        *LDE . LIST+CVTS
        'SED ( *)
        JP0   WRK3
WRK2X-  JP0 *
WRK3-   GOAC#*-WRK4-WRK2X
WRK4-   'STE   WRK4X
        RSX  SI* LIST+VORD
        SXD  S WORKS-LIST
        JP0   WRK4X
        SXD  S MOVINGS-LIST
        JP0   WRK4X
        SXD  S FREEDOMS-LIST
        JP0   WRK4X
        SXD  S FIXEDS-LIST
        JP0   WRK4X
        *JP0 .  FREESUB
        JP0   WRK5
        *JP0 .  FREEDOM      *** FROR DEBUG ONLY
        JP0   WORKER+1
WRK5-   REX . WORKS-LIST
        MOVEL#VORD**-SPECB*#
        'DPX #|* LIST+VORD
WRK4X-  JP0 *
WORKEX- JP0 *
CONSTART-
        'STE   CONSTARTX
        RSX . NEWCON
        GOAC#*-CNST1-CNST2
CNST1-  'STE   CNST1X
        *JP0   FREESUB
        JP0   CNST1A
        *JP0   ORDSLV**FREE
        JP0   CONSTARTX
CNST1A-REX . WORKS-LIST
        MOVER#VORD**-SPECB*#
CNST1X- JP0 *
CNST2-  *JP0   WORKER
        *JP0   ORDSLV
CONSTARTX-
        JP0 *
LPSTART-
        'STE   LPSTARTX
        *JP0   WORKER
        *JP0   ORDSLV
        *JP0   CLEAN
```

```
-----------------------------------------------------------------
                    HHL   APY#   ##7
LPSTARTX→
        JPQ #
ORDSLV→'STE  ORDSLVX
        REX . WORKS-LIST
        LGORL#SPECB*#=S→RELA
        REX . FREEDOMS-LIST
        LGORL#SPECB*#=S→ORDSLVI
ORDSLVX→
        JPQ #
ORDSLVI→
        'STE  RELX
        RSX γ|# LIST+TYPE
        RSX γ|γ LIST+TUPLE
        SXD γ •
        JPQ  RELX    **NOT A VARIABLE
        DPX  REEQ
        INX γ '
        'DPX γ REEQ
        DPX . RELAXTHIS
        LGORR#VFLW*#=S→RELB→RELC
CLEAN→ 'STE  CLEANEX
        REX . WORKS-LIST
        LGORR#SPECB*#=S→CLEANI
        REX . FREEDOMS-LIST
        LGORR#SPECB*#=S→CLEANI
CLEANEX→
        JPQ #
CLEANI→'STE  CLEANIX
        RSX SI• LIST+TYPE
        RSX SIS LIST+TUPLE
        JPX S#+2
CLEANIX→
        JPQ #
        LTAKE#VORD*#
        LGORR#VFLW*#=S→CLEAN2→CLEANIX
CLEAN2→SUBR#(LTAKE#CVTS*#)
IPCONCOMP→
        'STE  IPCONEX
        #⊟IPCP.•
        γ⊟IPCI.•
        #⊟IPCV.•
        #⊟B WHOS.•
        PROD#VA#*IVAL+LISTγ/PSIZE+LIST# =ROTS→BADOV
        PROD#VA+I#*IVAL+LIST+Iγ/PSIZE+LIST#→BADOV
        SUMM→ROTS→BADOV
        SUMM→IPγ→BADOV
        HDIF.VA#
IPCONEX→
        JPQ #
IPCONCOMPI→
        'STE  IPCONEXI
```

```
-------------------------------------------------

            HHL   APY5   010

        αBIPCP,α
        γBIPCI,α
        αBIPCV,α
        ΔBBWHOS,α
        PRODΞVAα=IVAL+1+LISTγ/PSIZE+LISTΔ=ROTS→BADOV
        PRODΞVA+1α=IVAL+LISTγ/PSIZE+LISTΔ→BADOV
        DIFF→ROTS→BADOV
        SUMM→IP+1γ→BADOV
        HDIF.VA+1β
IPCONEX1→
        JPQ  α
RI→     JPQ  377750
CL→     JPQ  200000
ST→     JPQ  200001
LAST→    ZZLAST
```

PEN 11 AUG 229

HH. LYUO 001

.ITE:T	*LLCROSS	PSATPEN1=002226
AT.OSTPEN	LPFIND=001026	PSAVE
*ATSTATE=003524	LPFINDP=001030	PSCONVERT=002306
ARCTAN	*LPICNUM=003557	PSEUDO=001605
ATATAP	LPLOST	PSEXIT=002322
ATBITS	LPSEESIZE	PSIZE
ATCIRCLE	*LPSEEN=003555	PSNEED
ATICL	LPSEE=001101	*PSNNPS=003600
ATICC	LPSEES=001035	PSNPS
ATILL	LPSEES2=001053	PSPENLSIZE=003444
ATINS	LPSEES1=001050	PSPENOSIZE=003454
ATLINE	LPSEES4=001070	PSPENISIZE=003514
ATPOINT	LPSEES3=001065	PSPL=200042
..OV	*LPSTATE=003561	*PSRAD=003601
BASICFILE	*LPTT=003560	*PSSEESIZE=003577
BWHOS	LP0	*PSTS=003576
CACT	*LSHAFT=003556	*PSTSEE=003604
*CCCROSS	LSP	*PSTT=003602
CEP	MASBL	*PSTU=003603
CHVAR	MASTERS	PSX1=002632
CIRCEN	MERGERS	PSX2=002634
CIRCLES	MOVED	PSY1=002633
CL=003416	*MOVE	PSY2=002635
*CLCROSS	MOVIT	PSY
COMP	MOVINGS	PS0
CONLET	NAME	PSA
CONSTRAINTS	NCON	PSB
CPNAME=200054	NEWCONS	PVAL
CSP	NLIST	PWHOS
CS0	*NORMALIZE	PYTHAGORIAN
CURPICS	*NPDENOM=003570	*PYTH1
CVAL	*NPDX=003563	*PYTH
CVTS	*NPDX2=003567	RI=003415
DEADS	*NPDY=003565	S
DESIGS	*NPDY2=003566	*SISTATE=003605
*DIFF	*NPOL	S10
*DIREC1	NPOLR=001463	SCALERS
*DIREC	NPOLX=001601	SCCEN
DISPLAY FILE	*NPOLS=003562	*SCNORM
DISPLAY	NPOLDL=001602	*SCPSPL=003606
*DSHAFT=003525	NPOL1=001514	SCSZ
ERRORSTOP	NPOL2=001524	SHAFT
*ERROR	NPOL3=001537	SHAFTUSE
*ERROR1	NPOL4=001555	SHAFTTEST=001372
*EXAMINE	*NPOLN=003573	SHAFTTESTX=001462
*FABVAL	NPOL5=001566	SHAF1=001402
FIXEDS	NPOL6=001577	SHAFTSIZE=001404
FREES	*NPTS=003564	SHAFTPOS=001440
FREEDOMS	*NPXP=003571	SHAFTINS=001433

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HHL LYUO 002

GETIT	*NPYP=003572	SIZE
▾GORR	NP0	SMASBL
▾HDIF	NP8	SNDISP
HOLDERS	NTOSHO	SPECB
HOVCODE	NUMBERS	SQ60A
HOVP1	NVAL	SQ60BEE=001014
HOVP2	ONCIRCLES	SQRT
HOVS	ONLINES	SSHOW
HOWBIG	ORIGIN	ST=003417
▾HSUM	PATAP	▾STAB
IBVCODE	PBOCC	▾STAE
IBVERTS	PBOCS	STARTS=001000
IBVM	PBOCP	▾SUMM
ICON	PBOLE	SVAL
*INCLO=003536	PBOLS	*T1
*INDD=003533	PBOLP	*T2
*INDENOM=003554	PENDSIZE	TEXTS
*INDX=003532	PENISIZE	TIME
*INDX1=003545	PENLSIZE	TOPOS
*INDX2=003550	PENLOC=001714	TPVAL
*INDY=003531	PENSEESIZE	TPVALS
*INDY1=003544	*PENSEEN=003574	TR1A=001147
*INDY2=003551	PENSEE=001106	TR1B=001153
*INFF=003535	PERIODIC=001341	TR1C=001157
*INR1=003527	PICBLKS	TR1D=001163
*INR2=003530	PICCHANGE	TR2=001175
*INRAO=003537	PICNUM	TR2AA=001177
INSTANCES	PICTURES	TR2A=001202
*INTCLS=003526	PINS	TR2B=001205
*INTLINES=003547	PLS	TR2C=001210
INTOC=002700	PNAME	TR2D=001213
INTOCL=003130	POINTS	TR2E=001216
INTOL=003253	PPART	TR3=001220
INTOCX=003120	PPARTM	TR5=001230
INTOCN=003127	*PREDIC=003575	TR55=001225
INTOC1=002720	▾PROD	TR6=001241
INTOC2=002753	PS1=001634	*TR60=003607
INTOC3=002773	PS1A=001640	*TR76=003613
INTOC4=003000	PS1C=001742	TRACK=001113
INTOC5=003020	PS1I=001662	TRACK1=001122
INTOC8=003105	PS1L=001716	TRACK2=001135
INTOC6=003045	PS1P=001675	TRAD=003423
INTOC7=003065	PS1TP=001672	TRAPRED=001312
INTOC9=003113	PS1X=002020	*TRBITS=003611
INTOC10=003116	PS2=002022	TRBUSY
INTOC11=003121	PS2A=002106	*TRCENT=003610
*INTOCLS=003546	PS2C=002176	*TRINC=003612
INTOCL1=003150	PS2CON=002131	TRLOST=001274
INTOCL2=003177	PS2CON1=002136	TRLP=001252
INTOCL3=003216	PS2CON1X=002141	TRLP2B=001265

HHL LYUO 003

INTOCL4=003241	PS2I=002143	TRLP2C=001267
INTOLX=003414	PS2I1=002161	TRLP2D=001271
INTOL1=003331	PS2I1X=002165	TRLP2=001263
INTOL2=003355	PS2L=002171	TRNSA=001166
INTOL3=003366	PS2P=002126	TROUT=001365
INTOL4=003401	PS2S=002034	TRPOINT=001171
INTSTART	PS2SE=002103	TRRADIUS
*INTS=003534	PS2SLOC=002104	TRREX=001244
*INX1Y2=003553	PS2X=002202	TRREX1=001251
*INX2Y1=003552	PS3=002323	TRRES=001355
*INXP=003541	PS3A=002325	TRSAV=001303
*INXP1=003542	PS3C=002406	*TRSA=003614
*INYP=003540	PS3I=002333	*TRSB=003615
*INYP1=003543	PS3L=002337	*TRSC=003616
IN*	PS3R=002366	*TRSD=003617
IN8	PS3X=002451	*TRSO=003620
IPCI	PS4=002452	TR*
IPCONS	PS5=002462	TR8
IPCOTP	PS5C=002501	TUPLE
IPCP	PS5CC=002511	TVAL
IPCV	PS5CH=002526	*TWINNORM
IPOS	PS5CC3=002560	TXTS
IROT	PS5CC2A=002541	TYPE
ISIZE	PS5CC4=002555	VA
IVAL	PS5L=002471	VARIABLES
IWHAT	PS5LL=002652	VARLOC
IWHOS	PS5LC=002636	VCON
*JZA	PS5NE=002562	VFLW
KIND	PS5PUT=002623	VORD
LAST=003420	PS6=002663	WHERE
*LOAB	PS61=002677	WORKS
*LOAE	PSAL=002267	*ZZLAST=003621
LEP	PSAP=002205	*
LINES	PSATPEN=002223	ΔROT=200056
LIST	PSATCEN=002234	ΔSIZE=200055

```
---------------------------------------------------------
                    HHL   LYUO   004
  #FLITEIT= 200050                                =      200050
  #FLOSTPEN= 200051                               =      200051

  ATPOINT=SKM 3.2 200044                          =  1762200044
  ATLINE=SKM 3.3 200044                           =  1763200044
  ATCIRCLE=SKM 3.4 200044                         =  1764200044
  ARCTAN=0JPO   CACT                              =340500200010
  ATILL=SKM 3.5 200044                            =  1765200044
  ATICL=SKM 3.6 200044                            =  1766200044
  ATICC=SKM 3.7 200044                            =  1767200044
  ATBITS= 200044                                  =      200044
  ATINS=SKM 3.8 ATBITS                            =  1770200044
  ATATAP= 2    **ATTACHER THING                   =           2

  BASICFILE= 200033                               =      200033
  BADOV= 200100                                   =      200100
  BWHOS= 4     **TO WHICH PICTURE BLOCK BELONGS
                                                  =           4

  CACT= 200007+1                                  =      200010
  CVAL= 16     ** CIRCLE ANGLE AND RADIUS         =          16
  CSO=RFD 0+1                                     =301200000001
  CIRCEN= 14   ** CIRCLE CENTER                   =          14
  CSP= 10      ** CIRCLE START POINT              =          10
  CEP= 12      ** CIRCLE END POINT                =          12
  CIRCLES= 3*MASBL+PICTURES                       =       24225
  CVTS= 6      ** VARIABLE TO MOVE TO SATISFY THIS
                                                  =           6

  CHVAR= 20    **# CHANGABLE VARIABLES            =          20
  COMP= 16     **CONSTRAINT COMPUTATION ROUTINE
                                                  =          16

  CURPICS= 15*SMASBL+LIST+1                       =       24117
  CONSTRAINTS= 4*SMASBL+LIST+1                    =       24031
  CONLET= 12   **CONSTRAINT LETTER CODE           =          12

  DISPLAY FILE= 100000                            =      100000
  DEADS= 11*SMASBL+LIST+1                         =       24067
  DISPLAY= 5   **MASTER DISPLAY SUBROUTINE        =           5
  DESIGS= 13*SMASBL+LIST+1                        =       24103

  ERRORSTOP=SKM 4.10 377730                       =  1712377730

  FREES= 5*SMASBL+LIST+1                          =       24037
  FREEDOMS= 6*SMASBL+LIST+1                       =       24045
  FIXEDS= 12*SMASBL+LIST+1                        =       24075

  GETIT= 7     **MASTER FORMATION SUBROUTINE
                                                  =           7

  MOVS= 15*MASBL+PICTURES                         =       24561
```

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```
------------------------------------------------------------------

                 HHL   LYUO   005

MOWBIG= 6     **MASTER SCSZ COMPUTATION       =            6
MOVP1= 10     ** FIRST HORIZ OR VERT POINT
                                              =           10

MOVP2= 12     ** SECOND HORIZ OR VERT POINT
                                              =           12

MOVCODE= 14 ** HORIZ=1, VERTICAL=2, EITHER=0
                                              =           14

MOLDERS= 2*SMASBL+LIST+1                      =        24015


IWHAT= 14     ** WHAT PIC THIS IS INSTANCE OF
                                              =           14

IWHOS= 10     **INSTANCE IN WHAT              =           10
INSTANCES= 6*MASBL+PICTURES                   =        24345
IPOS= IROT+2                                  =           20
IROT= 16                                      =           16
IN0= 32                                       =           32
IN8= 33                                       =           33
IPCONS= 11*MASBL+PICTURES                     =        24441
ICON= 10                                      =           10
IPCP= 10      **POINT IN INSTANCE-POINT CONSTRAINT
                                              =           10

INTSTART= 200135                              =       200135
IBVERTS= 14*MASBL+PICTURES                    =        24535
IPCOTP= 16    ** INSTANCE-POINT CONSTRAINTS WITH THIS
                          VIRGIN              =           16
ISIZE= 16     ** R                            =           16
IVAL= 20      ** R COS θ, R SIN θ, X, Y       =           20
IBVW= 10      ** WHICH INSTANCE IS VERTICAL
                                              =           10

IPCI= 12      ** INSTANCE IN INSTANCE-POINT CONSTRAIN
                         T                    =           12

IPCV= 14      ** VIRGIN POINT IN INSTANCE-POINT CONST
                         RAINT                =           14

IBVCODE= 12 ** INSTANCE TO BE VERTICAL, HORIZ, ETC
                                              =           12


KIND= 13      **1=NOT IN PIC, 2=PPART, 3=PICBLKS
                                              =           13


LIST= 24000 **LIST STRUCTURE START            =        24000
LSP= 10       **START OF LINE                 =           10
LEP= 12       **END OF LINE                   =           12
LPLOST=SKM 4,10 200042                        =   1712200042
LPSEESIZE= 5                                  =            5
LINES= 1*MASBL+PICTURES                       =        24201
LP0= 23                                       =           23


MASBL= 24     **MASTER BLOCK LENGTH           =           24
MOVED=SKM 4,10 200034                         =   1712200034
MASTERS= LIST+1                               =        24001
```

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                HHL  LYUO  006

MERGERS= 10*SMASBL+LIST+1                  =      24061
MOVIT= 10    **HOW TO MOVE COORDINATES     =         10
MOVINGS= 14*SMASBL+LIST+1                  =      24111

NP•= IN•                                   =         32
NPθ= INθ                                   =         33
NUMBERS= 10*MASBL+PICTURES                 =      24415
NCON= 17     **# CONSTRAINTS SHOWN         =         17
NTOSHO= 14  ** SCALER TO BE SHOWN          =         14
NVAL= 16     ** R COS •, R SIN •, X, Y     =         16
NLIST= 23000        **MODEL EMPTY LIST STRUCTURE
                                           =      23000

NEWCONS= 16*SMASBL+LIST+1                  =      24135
NAME= 4      **NAME OF HEADER BLOCKS       =          4

ORIGIN= 1000                               =       1000
ONLINES= 12*MASBL+PICTURES                 =      24465
ONCIRCLES= 13*MASBL+PICTURES               =      24511

PICTURES= 22*SMASBL+LIST+1                 =      24155
PVAL= 20     ** COORDINATES OF POINT       =         20
PENSEESIZE= 5                              =          5
POINTS= 4*MASBL+PICTURES                   =      24275
PICNUM= 377724       **#OF PICTURE YOU WANT
                                           =     377724

PICCHANGE=SKM 4.10 CPNAME                  = 1712200054
PSNEED=SKM 4.10 200041                     = 1712200041
PSNPS= 740                                 =        740
PYTHAGORIAN= 200007                        =     200007
PENLSIZE= 6000                             =       6000
PENDSIZE= 10000                            =      10000
PS•= 5                                     =          5
PSα= 4                                     =          4
PSγ= 3                                     =          3
PSθ= 2                                     =          2
PENISIZE= 5000                             =       5000
PICBLKS= 2  **NON PICTURE STUFF IN PICTURE
                                           =          2

PPART= 4     **PICTURE PARTS               =          4
PPARTM= 10  **MOVING PICTURE PARTS         =         10
PATAP= 12    **ATTACHERS OF THIS PICTURE   =         12
PINS= 14     **INSTANCES OF THIS PICTURE   =         14
PSIZE= 16    **SIZE OF THIS PICTURE        =         16
PNAME= 17    **NAME OF PICTURE, 36 BITS    =         17
PSAVE= 20    **6 REGISTERS TO SAVE IN PICTURE
                                           =         20

PLS= 14      ** LINES ND CIRCLES ON THIS POINT
                                           =         14

PBOCC= 10    ** CENTER OF POINT ON CIRCLE
                                           =         10
```

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--------------------------------------------------------
                    HHL   LYUO   007
  PBOCS= 12     ** START OF POINT ON CIRCLE =            12
  PBOCP= 14     ** POINT TO BE ON CIRCLE    =            14
  PBOLE= 10     ** END POINT OF LINE        =            10
  PBOLS= 12     ** START OF POINT ON LINE   =            12
  PBOLP= 14     ** POINT TO BE ON LINE      =            14
  PWHOS= 6      **PICTURE IN PICTURES       =             6

  SMASBL= 6     **SMALL MASTER BLOCK LENGTH FOR DESIGNA
                          TERS              =             6
  SCSZ= 200034                              =        200034
  SØRT=▷JPQ  200006                         =540500200006
  SHAFT= 377620                             =        377620
  S0θ°A= 200004                             =        200004
  SCCEN= 200035                             =        200035
  S1θ= 34                                   =            34
  SNDISP= 200032                            =        200032
  SCALERS= 3*MASBL+PICTURES                 =         24251
  S= 7                                      =             7
  SIZE= 11      **SIZE OF BLOCK             =            11
  SSHOW= 14     ** NUMBERS SHOWING THIS SCALER
                                            =            14
  SVAL= 16      ** VALUE OF SCALER          =            16
  SPECB= 2      **SPECIFIC BLOCKS           =             2
  SHAFTUSE=SKM 4.10 ΔSIZE                   =    1712200055

  TIME= 10000.                              =         23420
  TRBUSY=SKM 4.10 200134                    =    1712200134
  TRRADIUS= 4000                            =          4000
  TYPE= 0       **TIES TO SPECB IN MASTER BLOCK
                                            =             0

  TRθ= 24                                   =            24
  TRB= 25                                   =            25
  TEXTS= 7*MASBL+PICTURES                   =         24371
  TUPLE= 14     **# VARIABLES               =            14
  TVAL= 14      ** R COS θ, R SIN θ, X, Y   =            14
  TXTS= 20      ** POINTER TO TEXT SHOWN    =            20
  TOPOS= 3*SMASBL+LIST+1                    =         24023
  TPVAL= 14     **X,Y LOCATION              =            14
  TPVALS= 5*MASBL+PICTURES **TYPICAL VARIABLES
                                            =         24321
 *T2=                                       =         14232
 *T1= 1                                     =             1

  VA= LIST+PVAL                             =         24020
  VCON= 17      ** CONSTRAINTS ON THIS VARIABLE
                                            =            17
  VARLOC= 15    **LOCATION OF VARIABLES IN BLOCK
                                            =            15
  VORD= 6       **ORDERING OF VARIABLES     =             6
  VFLW= 10      ** CONSTRAINTS WHICH THIS VARIABLE IS T
                          O SATISFY         =            10
```

```
-----------------------------------------------------------

              HHL   LYUO   010

VARIABLES= 1*SMASBL+LIST+1                   =      24007


WORKS= 1*SMASBL+LIST+1                       =      24053
WHERE= 12     **LOCATION OF THING IN PICTURE
                                             =         12


** 1                                         =          1
```

```
----------------------------------------
                HHL   LYUO   011
**DEF EXAMINE|*→B
'*IOS*'
STE B
**END

**DEF NORMALIZE|P→C/S*F=R→Q
LDA P **POINT P AT
SUB C **CENTER C TO BE
SAB (-'F',) **NORMALIZED TO 2F=S
*JOV Q **AND IF OUT, GO TO
DIV S **Q, LEAVE RESULT
*JOV Q-'S'+'S'        **IN R
STA R
**END

**DEF MOVE|A→B
*LDE A
STE B
**END

**DEF MDIF|P,Q→R
LDA P
SUB Q
SCA (-1,-1,,-1,-1)+((Q)∧(7,70,))
STA R
**END

**DEF JZA|P
JPA *+3
JNA *+2
JPQ P
**END

**DEF SCNORM|P→Q=R→S
T1=Q
NORMALIZE|P→SCCEN+T1/SCSZ=R→S
**END

**DEF DIFF*P→Q=R→S
LDA P
SUB Q
*JOV S
STA R
**END

**DEF FABVAL*P→Q
LDA P
JPA *+2
COM A
STA Q
```

```
-----------------------------------------------------

                HHL  LYUO  012

--END


--DEF  PYTHI#P→Q,R→S=T→U
LDA R
SUB S
*JOV U+'S'-'S'
STA B+'R'-'R'
LDA P
SUB Q
*JOV U+'Q'-'Q'
*JPQ PYTHAGORIAN
*JOV U
STA T
--END

--DEF  PYTH#P→Q=T→U
PYTHI#P→Q,P+1→Q+1=T→U
--END

--DEF  DIREC1#P→Q,R→S=T→U
LDA R
SUB S
*JOV U+'S'-'S'
STA B+'R'-'R'
LDA P
SUB Q
*JOV U-'Q'+'Q'
*JPQ CACT
STA T
--END

--DEF  DIREC#P→Q=T→U
DIREC1#P→Q,P+1→Q+1=T→U
--END

--DEF  HSUM#P,Q→R
LDA P
ADD Q
SCA {-1,-1,,-1,-1}+('Q')+(7,70,))
STA R
--END


--DEF  NPOL#P→L=S
'DPX_P A
'DPX_L A
*JPQ NPOLR
STA S
STB S+1
--END
```

```
----------------------------------------
              HHL  LYUO   013

--DEF  SUMM•P-Q=R-S
LDA P
ADD Q
•JOV S
STA R
--END

--DEF  PROD•A*B/C=D-E
LDA A
MUL B
DIV C
•JOV E
STA D
--END

--DEF  LDAE•A,B,C,D
LDA A
LDB A+B
LDC A+C
LDD A+D
--END

--DEF  STAE•A,B,C,D
STA A
STB A+B
STC A+C
STD A+D
--END

--DEF  CLCROSS•C-L=R-S,T
DPX L A
•DPX C A
•LDE S ** TO GET S IN Q
•JPQ INTOCL
JPQ T ** ONLY ONE INTERSECTION
STA R
STB R+1
--END

--DEF  TWINNORM•P-Q=R,S
LDA P
SUB Q
NOA (0)
STA R
STD S
COM S
LDA P+1
SUB Q+1
NOA S
SKN..D
```

```
---------------------------------------------
                HHL  LYUO  014
 JPO *+1
 SCA D
 JPO *+1
 EKA R
 COM D
 SCA D
 EKA R
 STA S
 **END

 **DEF  CCCROSS#P→Q=R→S,T
 OPX P A
 'OPX Q A
 *LDE S **TO GET Q=S
 *JPO INTOC
 JPO T **ONLY ONE INTERSEC
 STA R
 STB R+1
 **END

 **DEF  LLCROSS#P→Q=R→S
 OPX P A
 'OPX Q A
 *JPO INTOL
 *JOV S
 STA R
 STB R+1
 **END

 **DEF  GORR#A*Q=B→B→C
 'OPX*T2+(C)-(C)
 INX*A+1
 JPO T1+(C)-(C)
 T2→    REX*B+(C)-(C)
 JPO C
 T1→    RSX*|*LIST
 '*RSX*|*LIST-1
 INX*|*0
 DEX*1
 *LDE*LIST-1
 'SED (*)
 JPO T2+(C)-(C)
 *JPO B
 JPO T1+(C)-(C)
 **END

 **DEF  ERROR#*→P
 *JPO (ERROR1#*→P)
 **END
```

```
---------------------------------------------
                    HHL   LYUO   ØIS
--DEF  ERROR!#ø→P
'STE ø+!
SKZ ERRORSTOP
'øø
JPØ P
--END

--DEF  LDAB#P
LDA P
LDB P+1
--END

--DEF  STAB#P
STA P
STB P+1
--END

--DEF  ØBA,ø
        RSXø|øLIST+A
--END
```

```
------------------------------------------------------------

                    HHL   LYUO   016

  200005|
        JPQ   SQ**SEE                      |140500 001014|   005
  200040|
        JPQ   STARTS                       |140500 001000|200040
        *JMP  PSEUDO                       |400500 001605|   041
PSPL←   0                                  |000000 000000|   042
        0                                  |000000 000000|   043
        0      **THINGS SEEN               |000000 000000|   044
  200054|
CPNAME← 0                                  |000000 000000|   054
*SIZE←  0                                  |000000 000000|   055
*ROT←   0                                  |000000 000000|   056
  200134|
        *JMP  TRACK                        |400500 001113|   134
 ORIGIN|
```

```
-----------------------------------------
                HHL   LYUO   001
STARTS→ CSQ54
        DPX  LPSEEN
        DPX  PENSEEN
        MKZ  TRBUSY
        MKN  LPLOST
        MOVEISHAFT→LSHAFT
        MOVEIPICNUM→*LPICNUM
        STE  CPNAME
        RXF 55 LPFIND
        JPQ  INTSTART
S0**SEE→
        RSX 51* LPSEEN
        JPQ *+3
        *LDE 51* LPSEE
        STE 51* PENSEE
        -1JPX 51**-2
        MOVEILPSEEN→PENSEEN
        DPX  LPSEEN
        DPX  LPTT   **SO IT'LL SEE SAME LINE AGAIN
        JPQ  200004
LPFIND→ CSQ55
        21IOS 55 30000
LPFINDP→
        SNZ  LPLOST
        JPQ  LPSEES
        *LDE *(60 777777)
        STE  PREDIC
        DPX  LPSEEN
        **IF LIGHT PEN NOT LOST
LPSEES→REX LP**(60 777777)
        *LDE LP* 0
        *ITE ( 377,,377)
        *SED  LPTT  **SAME POINT AS LAST TIME
        JPD  LPSEES
        STE  LPTT
        DEX LP* DISPLAY FILE      **INVISIBLE POINT?
        SXL LP**BASICFILE
        JPD  LPSEES
        RSX LP* LPSEEN
        JPQ  LPSEES2
LPSEES1→
        *LDE  LPTT
        SED LP* LPSEE
        JPD  LPSEES
LPSEES2→
        -1JPX LP* LPSEES1
        RSX LP* LPSEEN
        INX LP* 1
        SXL LP* LPSEESIZE
        JPD  LPSEES
```

```
---------------------------------------
                HHL   LYUO    002
        MOVEILPTT→LPSEE-1 LP0
        DPX LP0 LPSEEN
        RSX LP0 PENSEEN
        JPQ  LPSEES4
LPSEES3→
        *LDE  LPTT
        SED LP0 PENSEE
        JPD  LPSEES
LPSEES4→
        -1JPX LP0 LPSEES3
        RSX LP0 PENSEEN
        INX LP0 1
        SXL LP0 PENSEESIZE
        JPD  LPSEES
        MOVEILPTT→PENSEE-1 LP0
        DPX LP0 PENSEEN
        JPD  LPSEES
LPSEE→   .
         .
         .
         .
         .
PENSEE→  .
         .
         .
         .
         .
TRACK→  MKN   TRBUSY
        EXAMINE|60→S1STATE
        SKN 2.6 S1STATE      **CONNECT
        JPQ  TRACK1
        SKN 2.8 S1STATE
        JPQ  TRACK
TRACK1→DPX 60 TR60
        CS0 60
        1IOS 60 30010
        EXAMINE|55→LPSTATE
        1DPX 55 TR55
        *LDE  PREDIC
        STE  TRCENT
        1IOS 55 30000
        SKZ  LPLOST
        JPQ  TRLOST
TRACK2→REX 55 TRLP
        *LDE  TRCENT
        *STE  TRPOINT
        STE  TRPOINT+1
        MKZ 1.1 TRBITS
        *LDE  TRCENT
        *STE  TRPOINT+2
```

```
                 HHL   LYUO   003
         STE   TRPOINT+3
         RSX  TR=(TRAD→ TRRADIUS)
         'REX  TRB|TR=
TR1A→    'ADX  TR= TRPOINT
         TSD   TRPOINT
         'ADX  TRB TRCENT
         'ADX  TR= TRPOINT
TR1B→    'ADX  TR= TRPOINT+1
         TSD   TRPOINT+1
         'ADX  TRB TRCENT
         'ADX  TR= TRPOINT+1
TR1C→    'ADX  TRB TRPOINT+2
         TSD   TRPOINT+2
         'ADX  TR= TRCENT
         'ADX  TRB TRPOINT+2
TR1D→    'ADX  TRB TRPOINT+3
         TSD   TRPOINT+3
         'ADX  TR= TRCENT
TRNSA→   SKN  1.1 TRBITS
         JPQ   TRLOST
         JPQ   TRACK2
TRPOINT→
         0
         0
         0
         0
TR2→     ●LDE   TRAD
         STE   TRINC
TR2AA→   CYR   TRINC
         RSX  TR= TRINC
         'REX  TRB*TRINC
TR2A→    TSD   TRPOINT
         'ADX  TRB TRPOINT
         REX  SS  TRLP2B
TR2B→    TSD   TRPOINT+1
         'ADX  TRB TRPOINT+1
         REX  SS  TRLP2C
TR2C→    TSD   TRPOINT+2
         'ADX  TR= TRPOINT+2
         REX  SS  TRLP2D
TR2D→    TSD   TRPOINT+3
         'ADX  TR= TRPOINT+3
         REX  SS  TRLP2
TR2E→    SXL  TR= 300
         JPQ   TR2AA
TR3→     MKZ   LPLOST
         'IOS  SS  20000
         'IOS  60  30030
         TSD   SCPSPL
         TSD   SCPSPL
```

```
------------------------------------------

              HHL   LYUO   004

TR55→   REX 55 0
        SKZ 2.6 LPSTATE
        1IOS 55 30000
TR5→    1IOS 60 20000
        0LDE  S1STATE
        1STE 0+2
        SKZ 2.6 S1STATE
        1IOS 60 30000
        OPX 76 TR76
        EXAMINE|76→76STATE
        RXF 76 TRSAV
TR6→    SKZ 2.9 S1STATE      **FLAG
        JPQ *TR60
        JPD *TR60
TRREX→  1STE  TRREX1
        REX
        REX
        REX
        REX
TRREX1→JPQ 0
TRLP→   MKN 1.1 TRBITS
        0JPQ  TRREX
        20INX 60 1
        0JPQ  TRREX
        20INX 60 1
        0JPQ  TRREX
        20INX 60 1
        1ADX TR8 TRPOINT+3
        RFD 60 TR2
TRLP2→  2ADX TR0 TRPOINT
        RFD 60 TR2B
TRLP2B→1ADX TR0 TRPOINT+1
        RFD 60 TR2C
TRLP2C→2ADX TR8 TRPOINT+2
   .    RFD 60 TR2D
TRLP2D→1ADX TR8 TRPOINT+3
        RXF 60 TR2E
        JPD  TRLP2
TRLOST→DPX  TRBITS
        MOVEI( LPFINDP)→1 TR55
        SNN  LPLOST
        RXF 47 47LOSTPEN
        1IOS 55 20000
        JPQ  TR55
TRSAV→  STA  TRSA
        STB  TRSB
        STC  TRSC
        STD  TRSD
        OPX  A
        10SCA (-1,-1,,-1,-1)
```

```
        STA  TRSO
TRAPRED→
        SKZ  LPLOST
        JPQ  PERIODIC
        MKN  PSNEED
        LDB  TRPOINT
        'LDB  TRPOINT+1
        LDA  TRPOINT+2
        'LDA  TRPOINT+3
        STA  TRPOINT
        20ADD  B
        20SCA {-1,0.,-1,0}
        EXA  TRPOINT
        20SUB  B
        LDA  TROUT
        'JOV #+2
        'LDA  TRPOINT
        21JOV #+2
        21LDA  TRPOINT
        STA  TROUT
        STA  PREDIC
        EXA  TROUT+1
        EXA  TROUT+2
        EXA  TROUT+3
        STA  TROUT+4
PERIODIC→
        REX
        RXF 47, 47LITEIT
        *JPQ  SHAFTTEST
        LDA  PICNUM
        EXA  LPICNUM
        'SUB  LPICNUM
        'JPA #+3 .
        'JNA #+2
        JPQ #+4
        MKN  PICCHANGE
        LDA  LPICNUM
        STA  CPNAME
TRRES→  LDA  TRSO
        30ADD  TRSO
        LDA  TRSA
        LDB  TRSB
        LDC  TRSC
        LDD  TRSD
        *MKZ  TRBUSY
        JPQ  *TR70
TROUT→  0
        0
        0
        0
```

```
----------------------------------------------
                    HHL  LYUO  006

        $
SHAFTTEST←
        1STE  SHAFTTESTX
        LDA  SHAFT
        EXA  LSHAFT **LAST POSITION
        10SUB  LSHAFT
        STA  DSHAFT **SHAFT CHANGE
        10JPA  SHAFI
        10JNA  SHAFI
        JPQ  SHAFTTESTX
SHAFI←  10DIV ( 40,40,,40,40)
        $10JOV  SHAFTTESTX **BIT ERROR
SHAFTSIZE←
        16LDA  DSHAFT
        JPA  $+3
        JNA  $+2
        JPQ  $+2
        MKN  MOVED
        MUL  SCSZ
        SAB  (-9.,)
        LDA  SCSZ
        SUB  B
        STA  B
        SUB  ( 2.)
        JNA  $+2
        LDB  ( 2.)
        ADD  ( 1777.,,0)
        JPA  $+2
        LDB  ( 1.,0)
        STB  SCSZ
        DIFF$16 ↑SIZE→14 DSHAFT=27 ↑SIZE→3 BADOV
        SKN  SHAFTUSE
        JPQ  SHAFTPOS
SHAFTINS←
      · DIFF$16 ↑ROT→13 DSHAFT=27 ↑ROT→BADOV
        JPQ  SHAFTTESTX
SHAFTPOS←
        OPX  ↑ROT
        15LDA  DSHAFT
        MUL  SCSZ
        SAB  (-9.,)
        LDA  SCCEN
        ADD  B
        STA  SCCEN
        33LDA  DSHAFT
        20JPA  $+3
        20JNA  $+2
        JPQ  $+2
        MKN  MOVED
        13LDA  DSHAFT
```

```
---------------------------------------------
              HHL   LYUO   007
         MUL  SCSZ
         SAB  (-9..)
         LDA  SCCEN+1
         ADD  B
         STA  SCCEN+1
SHAFTTESTX→
         JPQ  ∅
NPOLR→  'STE  NPOLX
         STA  NPOLS   **POINT..LINE
         RSX  NPβ  A
         RSX  NPα|NPβ  LEP+LIST
         RSX  NPβ|NPβ  LSP+LIST
         SXD  NPα|NPβ
         JPQ  NPOLDL  **DEGENERATE LINE
         LDA  VA NPα
         SUB  VA NPβ
         NOA  ( 0)
         STA  NPDX
         STD  NPTS
         COM  NPTS
         LDA  VA+1 NPα
         SUB  VA+1 NPβ
         NOA  NPTS
         SKN  4.9  D
         JPQ  ∅+3
         SCA  D
         JPQ  ∅+5
         EXA  NPDX
         COM  D
         SCA  D
         EXA  NPDX
         STA  NPDY
NPOL1→  MUL  A
         STA  NPDY2
         LDA  NPDX
         MUL  NPDX
         STA  NPDX2
         ADD  NPDY2
         SCA  (-1..)
         STA  NPDENOM
NPOL2→  'RSX  NPα  NPOLS
         LDA  NPα  VA    **X1
         MUL  NPDX2
         SAB  (-1.)
         DIV  NPDENOM
         STA  NPXP    **X POSITION
         LDA  NPα  VA+1**Y1
         MUL  NPDY2
         SAB  (-1.)
         DIV  NPDENOM
```

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```
            HHL   LYUO   010
        STA   NPYP
NPOL3-  LDA  NP8 VA    **XO
        MUL   NPDY2
        SAB  (-1.)
        DIV   NPDENOM
        ADD   NPXP
        *JOV  BADOV  **CAN'T HAPPEN
        STA   NPXP
        LDA  NP8 VA+1** YO
        MUL   NPDX2
        SAB  (-1.)
        DIV   NPDENOM
        ADD   NPYP
        *JOV  BADOV
        STA   NPYP
NPOL4-  LDA  NP0 VA+1
        SUB  NP8 VA+1
        SCA  (-1.)
        MUL   NPDX
        MUL   NPDY
        DIV   NPDENOM
        ADD   NPXP
        *JOV  NPOLN  **NO POINT
        STA   NPXP
NPOL5-  LDA  NP0 VA
        SUB  NP8 VA
        SCA  (-1.)
        MUL   NPDX
        MUL   NPDY
        DIV   NPDENOM
        ADD   NPYP
        *JOV  NPOLN
        STA   NPYP
NPOL6-  LDA   NPXP
        LDB   NPYP
NPOLX-  JPQ  *
NPOLOL-LDA   VA NP0
        LDB   VA+1 NP0
        JPQ   NPOLX
PSEUDO-'STE  PSEXIT
        SKN   LPLOST
        JPQ  *+3
        OPX   ATBITS
        JPQ   PSEXIT
        LDA   TROUT+4
        STA   PSTS
      13LDA   PSTS
        MUL   SCSZ
        SAB  ( 18.)
        ADD   SCCEN
```

```
---------------------------------------------------------
                HHL   LYUO   011
          STA   PENLOC
          11LDA   PSTS
          MUL   SCSZ
          SAB ( 10.,)
          ADD   SCCEN+1
          STA   PENLOC+1
          RSX PSa PENSEEN
          SXG PSa 0
          JPQ   PSATPEN
          LDA (PSPENLSIZE→ PENLSIZE,, 0)
          MUL   SCSZ
          STA   PSSEESIZE
PS1→      REX PSΔ 0
          DPX   PSNNPS
          RSX PSa PENSEEN
          JPQ   PS1X
PS1A→     LDA PSa PENSEE
          10CYA ( 0,0,,10.,0)
          CYA (-10.,)
          ITA ( 177777)
          RSX PSY A     **PSY=SEEN BLOCK
          PSB⊟TYPE,PSY
          2DPX PSB A
          STA PSΔ PSNPS+3
          SXD PSB CIRCLES-LIST
          JPQ   PS1C
          SXD PSB LINES-LIST
          JPQ   PS1L
          SXD PSB TPVALS-LIST
          JPQ   PS1TP
          SXD PSB FREES-LIST
          JPQ   PS1X
          SXD PSB POINTS-LIST
          JPQ   PS1P
PS1I→     MOVEIPENLOC→PSNPS PSΔ
          MOVEIPENLOC+1→PSNPS+1 PSΔ
          MOVEIPSSEESIZE→PSNPS+2 PSΔ
          INX PSΔ 4
          JPQ   PS1X
PS1TP→    LDAB⊟TPVAL+LIST PSY
          JPQ ⊟+3
PS1P→     LDAB⊟VA PSY
          STAB⊟PSNPS PSΔ
          DIFF→PENLOC→PS1X
          EXA   B
          DIFF→PENLOC+1→PS1X
          ⊟JPQ   PYTHAGORIAN
          JOV   PS1X
          SUB   PSSEESIZE
          JPA   PS1X
```

HHL LYUO 012

```
        INX PSΔ 4
        JPQ  PS1X
PENLOC→ 0
        0
PS1L→   RSX PSβ( PENLOC-VA)
        NPOL≡PSβ→PSγ=PSNPSPSΔ
        PYTH≡PSNPSPSΔ→VAPSβ=PSNPS+2PSΔ→PS1X
        SUB  PSSEESIZE        **SIZE OF PEN IN 36 BITS
        JPA  PS1X
        INX PSΔ 4
        JPQ  PS1X
PS1C→   RSX PSβ|PSγ CSP+LIST
        RSX PSγ|PSγ CIRCEN+LIST
        PYTH≡VAPSβ→VAPSγ=PSRAD→PS1X
        DIFF≡PENLOC+1→VAPSγ+1=PSTT→PS1X
        STA  B
        DIFF≡PENLOC→VAPSγ=PSTS→PS1X
        PYTHI→→→PS1X
        STA  PSTU
        SUB  PSRAD
        STA PSΔ PSNPS+4       **FOR CENTER
        FABVAL
        STA PSΔ PSNPS+2
        SUB  PSSEESIZE
        JPA  PS1X
        PROD≡PSTS×PSRAD/PSTU→PS1X
        SUMM→VAPSγ=PSNPSPSΔ→PS1X
        PROD≡PSTT×PSRAD/PSTU→PS1X
        SUMM→VA+1PSγ=PSNPS+1PSΔ→PS1X
        INX PSΔ 4
PS1X→   -1JPX PSα PS1A
        DPX PSΔ PSNNPS        **# OF NEAR POINTS
PS2→    RSX PSα PSNNPS
        SXG PSα 0
        JPQ  PSATPEN
        LDA (PSPENDSIZE→ PENDSIZE,,0)
        MUL  SCSZ
        STA  PSSEESIZE
        LDA ( 377,-0,,-0,-0)
        STA  PSTS
        DPX  PSTT
        JPQ  PS2X
PS2S→   1STE  PS2SE
        SETYPE,PSγ
        REX αIPSγ
        ΔBPQ S LIST+WHERE
        STAB≡PS2SLOC
        DIFF→SCCEN→PS2SE
        FABVAL
        SUB  SCSZ
```

```
----------------------------------------
            HHL   LYUO   013
    JNA *+2
    JPQ  PS2SE
    DIFF=PS2SLOC+1→SCCEN+1→PS2SE
    FABVAL
    SUB  SCSZ
    JNA *+2
    JPQ  PS2SE
    PYTH=PS2SLOC→PENLOC=PSTU→PS2SE
    SUB  PSTS
    JPA  PS2SE
    ADD  PSTS
    STA  PSTS
    SUB  PSSEESIZE
    JPA  PS2SE   **DOT TOO FAR AWAY
    MKN  α,β PSTT
    'DPX PSγ PSTT
PS2SE→ JPQ *
PS2SLOC→
    .
    .
PS2A→  RSX PSβ|PSα PSNPS+3        **GET NAME
    2RSX PSγ|PSα PSNPS+3          **GET TYPE
    SXD PSγ CIRCLES-LIST
    JPQ  PS2C
    SXD PSγ LINES-LIST
    JPQ  PS2L
    SXD PSγ INSTANCES-LIST
    JPQ  PS2I
    SXD PSγ TPVALS-LIST
    JPQ  PS2P
    SXD PSγ POINTS-LIST
    JPQ  PS2P
    αLDE PSγ LIST+TYPE
    'SED ( CONSTRAINTS-LIST)
    JPQ  PS2CON
    JPQ  PS2X
PS2P→  REX PSγ|PSβ
    αJPQ  PS2S
    JPQ  PS2X
PS2CON→INX PSβ LIST+CVTS+2
    'OPX PSβ PS2CON1
    PSβ⊟CHVAR,PSγ
    INX PSβ|PSβ
    JPQ  PS2CON1X
PS2CON1→
    LDA PSβ*     **SET TO FIRST VARIABLE
    RSX PSγ A
    αJPQ  PS2S
PS2CON1X→
    -2JPX PSβ PS2CON1
```

```
------------------------------------------------
              HHL  LYUO   014
        JPO  PS2X
PS2I←   GORR*VCON*PS8=PSY→PS2I1→PS2X
PS2I1←  'STE  PS2I1X
        *LDE PSY LIST
        'SED { IPCONS-LIST}
        JPO  *+2
PS2I1X←JPO  *
        PSY⊟IPCP.PSY
        *JPO  PS2S
        JPO  PS2I1X
PS2L←   PSY⊟LSP.PS8
        *JPO  PS2S
        PSY⊟LEP.PS8
        *JPO  PS2S
        JPO  PS2X
PS2C←   PSY⊟CSP.PS8
        *JPO  PS2S
        PSY⊟CEP.PS8
        *JPO  PS2S
PS2X←   -4JPX PS0 PS2A
        SKN 4,9 PSTT
        JPO  PS1
PSAP←   RSX  0 PSTT
        S⊟TYPE.0
        DPX  0 ATBITS+1
        2OPX S ATBITS+1
        *BPO S LIST+WHERE
        STAB*PSPL
        LDA { 1}
        SXD S POINTS-LIST
        LDA { 2,,1}
        SXD S INSTANCES-LIST
        LDA { 200,,1}
        STA  ATBITS
        JPO  PSCONVERT
PSATPEN←
        RSX PS0 PENSEEN
        SXD PS0 1
        JPO  PSATCEN
PSATPEN1←
        LDA  PENLOC
        LDB  PENLOC+1
        DPX  ATBITS
        *STA  PSPL
        STB  PSPL+1
        JPO  PSCONVERT
PSATCEN←
        RSX PS8 PSNNPS
        SXL PS8 1
        JPO  PSATPEN1
```

```
---------------------------------------------------------------
            HHL   LYUO   0 1 1
     ²RSX PSγ PSNPS+3
     SXD PSγ CIRCLES-LIST
     JPQ *+2
     JPQ  PSATPEN1
     LDA  PSNPS+4
     JPA  PSATPEN1
     ADD  PSSEESIZE
     JPA  PSATPEN1
     ADD  PSSEESIZE
     JNA  PSATPEN1
     RSX PSα PSNPS+3
     RSX PSα|PSα LIST+CIRCEN
     NORMALIZE(VAPSα→SCCEN/SCSZ→PSATPEN1
     NORMALIZE(VA+1PSα→SCCEN+1/SCSZ→PSATPEN1
     DPX PSα PSTT
     JPQ  PSAP
PSAL→ LDA  PSNPS
     LDB  PSNPS+1
     LDC  PSNPS+3
     LDD ( 1)
     ²RSX PSα PSNPS+3
     SXD PSα CIRCLES-LIST
     MKN ((ATCIRCLE)∧(377777,.)) + D
     SXD PSα LINES-LIST
     MKN ((ATLINE)∧(377777,.))+ D
     SXD PSα INSTANCES-LIST
     MKN ((ATINS)∧(377777,.))+ D
     *STC  ATBITS+1
     STD  ATBITS
     *STA  PSPL
     STB  PSPL+1
PSCONVERT→
     SCNORM(PSPL=²¹ SCPSPL→( 0)
     SCNORM(PSPL+1→1=²² SCPSPL→( 0)
PSEXIT→JPQ *
PS3→  RSX PSα PSNNPS        **REMOVE FROM PSNPS
     JPQ  PS3X    **IF NEAR POINT OUTSIDE
PS3A→ RSX PSβ|PSα PSNPS+3       **END POINT
     ²RSX PSγ|PSα PSNPS+3
     SXD PSγ CIRCLES-LIST
     JPQ  PS3C
     SXD PSγ LINES-LIST
     JPQ  PS3L
PS31→ RSX PSβ PSNNPS
     SXD PSβ 4
     JPQ  PS4
     JPQ  PS3R
PS3L→ PSγ⊟LSP,PSβ
     PS4⊟LEP,PSβ
     MOIFIVAPSγ,PSNPSPSα→PSTS
```

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HHL LYUO 016

```
        HDIFIVA PSa, PSNPS PSa
        MUL  PSTS
        NAB  ( 0)
        JPA  PS3R
        HDIFIVA+1 PSγ, PSNPS+1 PSa→PSTS
        HDIFIVA+1 PSa, PSNPS PSa+1
        MUL  PSTS
        NAB  ( 0)
        JPA  PS3R
        JPQ  PS3X
PS3R→   RSX  PSB PSNNPS
        DEX  PSB 4
        SXG  PSB 0
        JPQ  PSATPEN
        DPX  PSB PSNNPS
        SXD  PSB|PSa 0
        JPQ  PS3X
        LDAE#PSNPS PSB, 1,2,3
        STAE#PSNPS PSa, 1,2,3
        JPQ  PS3X
PS3C→   PSγ⊟CSP, PSB
        PSa⊟CIRCEN, PSB
        DIREC#VA PSγ →VA PSa=PSTS→PS3R
        DIREC#PSNPS PSa→VA PSa=PSTT→PS3R
        SUB  PSTS
        LDB  LIST+CVAL PSB
        SKZ  4,9 B
        COM  A
        JPA  #+3
        JNA  #+2
        DPX  A
        DPX  B
        CAB  (-1,)
        STA  PSTS
        LDA  PSB LIST+CVAL
        JPA  #+2
        COM  A
        SUB  PSTS
        JNA  PS3R
PS3X→   -4JPX PSa PS3A
PS4→    RSX  PSa PSNNPS
        SXG  PSa 0
        JPQ  PSATPEN
        SXD  PSa 4
        JPQ  PSAL
        SXD  PSa 10
        JPQ  PS5      **AT INTERSETCTION
        JPQ  PSATPEN**TOO MUCH CLUTTER
PS5→    2RSX PSa PSNPS+3
        2RSX PSB PSNPS+3+4
```

```
----------------------------------------
              HHL   LYUO   017
      SXD PS* CIRCLES-LIST
      JPQ  PS$C
      SXD PS* LINES-LIST
      JPQ  PS$L
      ERROR#PS*-PSATPEN1
PS$L-  SXD PS# LINES-LIST
      JPQ  PS$LL
      SXD PS# CIRCLES-LIST
      JPQ  *+2
      ERROR#PS#-PSATPEN1
      RSX PS* PSNPS+3
      RSX PS# PSNPS+3+4
      JPQ  PS$LC
PS$C-  SXD PS# CIRCLES-LIST
      JPQ  PS$CC
      SXD PS# LINES-LIST
      JPQ  *+2
      ERROR#PS#-PSATPEN1
      RSX PS* PSNPS+3+4
      RSX PS# PSNPS+3
      JPQ  PS$LC
PS$CC- RSX PS* PSNPS+3
      RSX PS# PSNPS+3+4
      MOVE1(  100,,2)-PSTSEE
      CCCROSS#PS*-PS#=PSX1-PS6,PS61
      STC  PSX2
      STD  PSY2
PS$CH- PYTH#PENLOC-PSX1=PSTS-PS$CC3
      STA  PSTS
PS$CC2A-
      PYTH#PENLOC-PSX2=PSTT-PS$CC4
      SUB  PSTS
      JNA  PS$CC3
PS$CC4-LDA  PSX1
      LDB  PSY1
      JPQ  *+3
PS$CC3-LDA  PSX2
      LDB  PSY2
PS$NE- STA  PSX1
      STB  PSY1
      PROD#(PSPEN1SIZE- PEN1SIZE,,0)*SCSZ=PSSEESIZE

      PYTH#PENLOC-PSX1=PSTS-PS6
      SUB  PSSEESIZE
      JPA  PSAL
      SCNORM1PSX1=PSTS-PS6
      SCNORM1PSY1-1=PSTS-PS6
      LDA  PSX1
      LDB  PSY1
      *STA  PSPL
```

```
--------------------------------------------------------
                 HHL  LYUO   020
        STB   PSPL+1
PS$PUT→LDA   PSNPS+3
        LDB   PSNPS+4+3
        LDC   PSTSEE
        *STA   ATBITS+1
        *STB   ATBITS+2
        STC   ATBITS
        JPO   PSCONVERT
PSX1→   0
PSY1→   0
PSX2→   0
PSY2→   0
PS#LC→ MOVEI{ 40,, 2}→PSTSEE
        CLCROSS#PSβ→PSα=PSX1→PS6,PS61
        STC   PSX2
        STD   PSY2
        JPO   PS$CH
PS#LL→ RSX  PSα  PSNPS+3
        RSX  PSβ  PSNPS+3+4
        LLCROSS#PSα→PSβ→PS6
        MOVEI{ 20,, 2}→PSTSEE
        JPO   PS$NE
PS6→    LDA   PSNPS+2
        SUB   PSNPS+2+4
        JNA   PSAL
        LDAE#PSNPS+4,1,2,3
        STAE#PSNPS,1,2,3
        JPO   PSAL
PS61→   JPO   PS$NE
        **INTERSECTION OF 2 CIRCLES
INTOC→ *1STE   INTOCX
        22STE   INTOCN       **NO INTERSECTION
        STA   INTCLS **POINTERS TO CIRCLES
        RSX  INα  A
        INβ⊟CSP,INα
        INα⊟CIRCEN,INα
        PYTH#VA INα→VA INβ=INR1→INTOCN
INTOC1→2RSX  INα  INTCLS
        INβ⊟CIRCEN,INα
        INα⊟CSP,INα
        PYTH#VA INα→VA INβ=INR2→INTOCN
        RSX  INα  INTCLS
        INα⊟CIRCEN,INα
        DIFF#VA+1 INβ→VA+1 INα=INDY→INTOCN
        STA  B
        DIFF#VA INβ→VA INα=INDX→INTOCN
        PYTH1→→→INTOCN
        STA  INDD
INTOC2→LDA   INR1
        ADD   INR2
```

```
--------------------------------------------
              HHL  LYUO   021
      AJOV *+1     **CIRCES CLOSE ENOUGH
      STA  B
      SUB  INDD
      JNA  INTOCN **CIRCLES TOO FAR APPART
      LDA  B
      SCA  (-1,)
      STA  INTS    **R1+R2/2
      LDA  INR2
      SUB  INR1
      STA  B
      JNA  *+2
      COM  A
      ADD  INDD
      JNA  INTOCN **ONE INSIDE OTHER
INTOC3→LDA  B
      MUL  INTS
      SAB  ( 1,)
      DIV  INDD    **A=F OF P26
      STA  INFF
INTOC4→HDIF:INDD,INFF→INCLO       **CENTER LINE OFFSET

      FABVAL→INTS
      SUB  INR1
      AJPA ( 0)    **SHOULD NEVER JUMP
      EXA  INTS
      ADD  INR1
      SCA  (-1,)
      MUL  INTS
      SAB  ( 1,)
      SQRT
      STA  INRAO
INTOC5→PROD:INDX*INRAO/INDD=INYP→INTOCN
      PROD:INDY*INRAO/INDD=INXP→INTOCN
      PROD:INDX*INCLO/INDD=INXP1→INTOCN
      PROD:INDY*INCLO/INDD=INYP1→INTOCN
      'DPX  INTOC8
INTOC6→SUMM:INXP1→INXP=INDX→( 0)
      DIFF:INYP1→INYP=INDY→( 0)
      SUMM→VA+1 IN0=INDY1→INTOC7
      SUMM:INDX→VA IN0=INDX1→INTOC7
      MKN  1,1 INTOC8
INTOC7→DIFF:INXP1→INXP=INXP→( 0)
      SUMM:INYP1→INYP=INYP→( 0)
      SUMM→VA+1 IN0=INYP→INTOC8
      SUMM:INXP→VA IN0=INXP→INTOC8
      MKN  1,2 INTOC8
INTOC8→REX  IN8 0
      BP0  IN8*+1
      JP0  INTOCN
      JP0  INTOC8 **SWAP
```

HHL LYUO 022

```
        JPO   INTOC10
        JPO   INTOC11**BOTH
INTOC0→LDA   INDX1
        LDB   INDY1
        JPO   *+1
INTOC10→
        LDA   INXP
        LDB   INYP
INTOCX→JPO *
INTOC11→
        LDA   INTOCX
        'ADD (  1)
        'STA   INTOCX
        LDC   INDX1
        LDD   INDY1
        JPO   INTOC10
INTOCN→JPO *
        **LINE AND CIRCLE INTERSECTION
INTOCL→*'STE   INTOCX
        ''STE   INTOCN
        STA   INTOCLS**CIRCLE..LINE
        'RSX IN* A
        ''LDA IN* CIRCEN+LIST
        *JPO   NPOLR **NEAREST POINT ON LINE
        STA   INXP
        STB   INYP
        'RSX IN* INTOCLS
        IN8⊟CIRCEN.IN*
        IN*⊟CSP.IN*
        SUB   VA IN8
        *JOV   INTOCN
        EXA   B
        SUB   VA+1 IN8
        *JOV   INTOCN
INTOCL1→
        PYTHI
        *JOV   INTOCN
        STA   INDD
        PYTH⊟VA IN*→VA IN8=INR1→INTOCN
        SUB   INDD
        JNA   INTOCN
        STA   B
        LDA   INR1
        ADD   INDD
        SCA {-1,}
        MUL   B
        SAB ( 1,)
        SQRT
        STA   INRAO
INTOCL2→
```

```
----------------------------------------
          HHL   LYUO   023
     IN8 BLSP.IN9
     IN9 BLEP.IN9
     DIFF=VA IN8 -VA IN9 =INDX-INTOCN
     DIFF=VA+1 IN8 -VA+1 IN9 =INDY-INTOCN
     LDB  INDX
     PYTHI---INTOCN
     STA  INDD
 INTOCL 3-
     PRODE INRAO* INDX/INDD=INXPI-INTOCN
     PRODE INRAO* INDY/INDD=INYPI-INTOCN
     'OPX  INTOC*
     SUMM-INYP=INDYI-INTOCL4
     SUMM=INXP-INXPI=INDXI-INTOCL4
     MKN  1.1 INTOC*
 INTOCL 4-
     DIFF=INYP-INYPI=INYP-INTOC*
     DIFF=INXP-INXPI=INXP-INTOC*
     MKN  1.2 INTOC*
     JPO  INTOC*
     **INTERSECTION OF 2 LINES
 INTOL- *'STE  INTOLX
     STA  INTLINES        **LINES IN QUESTION
     RSX  IN9  A
     IN8 BLSP.IN9
     IN9 BLEP.IN9
     TWINNORM=VA IN9 -VA IN8 =INDX1, INDY1
     'RSX  IN9 INTLINES
     IN8 BLSP.IN9
     IN9 BLEP.IN9
     TWINNORM=VA IN9 -VA IN8 =INDX2, INDY2
     RSX  IN9 INTLINES
     IN9 BLSP.IN9
 INTOL1-PRODE INDX2* INDY1=INX2Y1
     PRODE INDX1* INDY2=INX1Y2
     HDIF.INX2Y1-INDENOM
     PRODE INX2Y1*VA IN9 =INXP
     PRODE INX1Y2*VA IN8
     HDIF.INXP-INXP
     HDIF|VA+1 IN9 .VA+1 IN8
 INTOL2-MUL  INDX1
     MUL  INDX2
     ADD  INXP
     *JOV  INTOLX** NO POINT
     '6LDB  A
     SCB  (-9..)
     DIV  INDENOM
     *JOV  INTOLX
     STA  INXP
 INTOL3-PRODE INX2Y1*VA+1 IN8 =INYP
     PRODE INX1Y2*VA+1 IN9
```

```
-------------------------------------------------------
                  HHL   LYUO   024
        HDIF.INYP←INYP
        HDIF|VA INB. VA IN0
INTOL4←MUL   INDY1
        MUL   INDY2
        ADD   INYP
        •JOV   INTOLX
        16LDB   A
        SCB (-9.,)
        DIV   INDENOM
        •JOV   INTOLX
        STA   INYP
        STA   B
        LDA   INXP
INTOLX←JPQ  •
RI←     JPQ   377750
CL←     JPQ   200000
ST←     JPQ   200001
LAST←    ZZLAST
```

SERVICE 15 SEPT 62 263

```
LMH   Y3HT   001

*ABVAL
*ACTANG=203516
ACTEX=202524
ACTEQ=202504
ACTN1=202441
ACTN2=202453
ACTN3=202477
ACTP1=202445
ACTP2=202454
ACTP3=202466
*ACTSUM=203520
*ACTTT=203517
*ACTTS=203521
*ACTX=203514
*ACTY=203515
ARCTAN
BADOV
BSFAC
CACT=202423
CL=200000
CLEAN=200140
CMAG=200430
CMAG1=200453
CMAG2=200475
CMAG2A=200504
CMAG2B=200520
CMAG3=200526
CMALLON=201205
CMANG=200026
CMANGLES=201454
CMCEN
CMDAD=201372
*CMDAL=203535
CMDIRS=201432
CMDRAW=201231
CMDRAWS=201420
CMDRAWA=201425
CMDRAW1=201265
CMDRAW2=201275
CMDRAW3=201303
CMDRAW4=201310
CMEDGES=201443
CMEXIT=201277
CMFAC=177777
CMGNL=200546
CMGNL1=200574
CMGNL2=200731
CMGNL1EX=200722
CMGNL1A=200616

*LDAE
LMAG=201465
LMAGEXIT=202340
LMAG3=201734
LMAG2=201725
LMAG1=201504
LMAG1E=201636
LMAG1A=201547
LMAG1B=201573
LMAG1C=201607
LMAG1N=201615
LMAG1F=201662
LMAG1G=201676
LMAG1P=201704
LMAG4=201742
LMAG5=201764
LMAG5A=202015
LMAG5B=202051
LMAG5C=202071
LMAG5CA=202052
LMAG5CB=202122
LMAG5CC=202130
*LMCNT=203560
*LMDENOM=203547
LMDRAW=202240
LMDRAW1=202246
LMDRAW1A=202265
LMDRAW1B=202311
LMDRAWLOOP=202333
*LMDX=203542
*LMDY=203543
LMEND=200024
*LMEXR=203554
*LMEYR=203555
LMINC
*LMKCR=203557
LMKEY=202200
LMKEYEX=202216
LMKEY1=202217
LMKEY2=202223
LMKEYT=202232
LMKEYS=202225
LMNAME=200030
*LMSEND=203545
*LMSKEY=203551
LMSLR=202155
LMSLRX=202177
*LMSL=203556
*LMSST=203544

PLOTBLOCKS=200136
PLOTSTORAGE=200137
PLOTCIRCLE=203215
PLOTLINE=203057
PLOTBLOCKS2=202753
PLOV1=203211
PLOV2=203213
PLP
PLPEND=203012
PLPIOS=202772
PLPIT2=203044
PLPIT3=203053
PLPIT=203027
PLPK
PLPLBUSY
PLPLOTJMP=200131
PLPLOT=202637
PLPLSSAVE=203324
PLPLX=202641
PLPLRTNE=202754
PLPL1=202756
PLPL2=202757
PLPL3=202771
PLPL4=203000
PLPLRF2=203360
PLPLRF=203355
PLPPBI=203016
PLPP=203347
PLPSW
PLPSTOP=203006
PLPUBUSY
PLPUNCHJMP=200132
PLPUNCH=202634
PLPUX=202636
PLPURTNE=202654
PLPUL=202660
PLPUL2=202673
PLPUL3=202702
PLPUL4=202703
PLPUL5=202712
PLPUL6=202735
PLPWA=203317
PLREDFIL=203003
PLS
PLSUBK=203126
PLSUB=203205
PLSW=203312
PLTABLE
PLTABLELENGTH
```

CMGNL1B=200622	LMSTART=200022	PLTABLEFULL=203306
CMGNL1D=200723	*LMTS=203546	PLTF2=203307
CMGNL1BA=200636	*LMTT=203550	PLTLYK=203323
CMGNL1BB=200656	*LMXSR=203552	PLU
CMGNL1CA=200672	*LMYSR=203553	PLUEND=202743
CMGNL1C=200663	-MOVE	PLUSW
CMGNL1E=200676	NDISP=200031	PLUSTOP=202737
CMGNL3=201012	-NEARCR	PLUWA=203313
CMGNL2A=200752	-NORMALIZE	PLUWA2=203314
CMGNL3A=201023	-ORVAL	PLUWA3=203315
CMGNL4=201025	PBIK	PLWA=203310
CMGNL4X=201043	PBIK4	PLWA2=203311
CMGNL4A=201027	PBIK5	PLXSAVE=203316
CMGNL4AX=201042	PBIK6	PMAGPOINT
CMGNL4B=201031	PBITABLE=203342	PMAGNAME
CMGNL4C=201044	PBITABLE2=203345	[illegible]
CMGNL4D=201046	PI	
CMGNL4E=201060	PL1=203067	
CMGNL5=201063	PL1A=203101	
CMGNL6=201116	PL1PSW	-PYTH
CMGNL6A=201117	PL1TSW	-PYTH1
CMGNL6S=201164	PL2=203116	PYTHAGORIAN=202525
CMGNL6R=201146	PL2A=203123	PYTHAGORIANEX=202553
CMGNL6RX=201163	PLC1=203222	PYTHAGORIAN3=202554
CMGNL6SE=201204	PLC2=203247	PYTHAGORIAN1=202544
CMGNL6X=201203	PLCAK1	PYTHAGORIAN4=202562
CMGNL6SA=201172	PLCAK2	PYTHAGORIAN2=202547
CMGNL6SB=201177	PLCAK3	*PYTS=203563
CMLOOP1=201361	PLCAK4	*PYTT=203564
CMLOOP=201351	PLCALCBLKS=203234	*PYTU=203565
CMLOOPS=201353	PLCANGNEG=203232	RINTERLACE
CMMASK	PLCAK=203351	*S1DISPLAY=203566
CMMINRAD	PLCB2=203236	S1INK=202575
CMMINSTEP	PLCB3=203272	*S1INC=203567
*CMMID=203536	PLCB6B=203301	S1NULL=200326
*CMMRCEN=203523	PLCB6A=203300	S1NULL1=200327
CMNAME	PLCB4=203270	*S1STEPS=203570
CMNAME1=177776	PLCB6=203276	S12
*CMNUM1=203534	PLCB7=203303	S17
*CMNUMS=203537	PLCENTRY=203062	S10
*CMNUMDONE=203540	PLCE2=203200	S18
CMOFFSET=177773	PLCK1	SCCEN=200035
CMPTO=177774	PLCK2	-SCNORM
CMPT1=177775	PLCK3	SCRAMBLE=200346
CMRAD=200027	PLCK4	SCRAMX=200367
CMSCSZ=200373	PLCK5	SCRAM=200353
CMSETUP=201341	PLCK6	SCRAMER=200357
CMSSCSZ	PLCLEANJMP=200130	*SCRAMN=203571
CMSTART	PLCLEAN=202622	SCSZ=200374
*CMSTOPA=203526	PLCLX=202633	SC0

LMH Y3HT 003

*CMSTA=203533	PLCONT=203130	SCB
*CMSTEPS=203541	PLCONT2=203136	SETUP=200142
*CMTS=203525	PLCRATIO	SNDISP=200032
*CMTT=203531	PLCSW	SQ60SEE
*CMTU=203530	PLCWA=203350	SQ60A=200200
*CMTV=203532	PLCWA2=203322	SQ60FEW=200313
*CMTW=203527	PLCX=203302	SQ60D=200266
*CMXRCEN=203522	PLEADER	SQ60I=200212
*CMYRCEN=203524	PLEENTRY=203155	SQ60IA=200214
CM#	PLENDJMP=200133	SQ60IR=200250
CMB	PLEND=202642	SQ60IS=200233
CONFIGS=200165	PLESW	SQ60IB=200224
CSQ	PLFC	SQ60IC=200226
←DIFF	PLFCK=203334	SQ60IRR=200253
←DIREC1	PLFLK=203336	SQ60D3=200310
←DIREC	PLIESCIRCLE=201317	SQ60D2=200303
DISPLAY FILE	*PLIESTS=203562	SQ60D1=200272
DISPLAYFILESIZE	PLINTSTART=200135	SQ60FEWX=200324
←DUALNORM	PLINTSTART2=203045	SQRT
ERRORSTOP	PLIOSBITS=203325	SQUARE ROOT BY HPP=20
	2341	
←ERROR	PLITK	ST=200001
←ERROR1	PLITWA=203056	←STAB
←EXAMINE	PLLAST=203362	←STAE
←FABVAL	PLLK1	STARTS
FRESH START	PLLK2	STOPIFFULL
←FULL	PLLK3	←SUMM
←FULL1	PLLK4	*T1
←HDIF	PLLK5	TRACK
←HSUM	PLLK6	TRBUSY
I20=200020	PLLOWFILTER	TWINKLE
I4=200004	PLLSW	UNITS=200144
INTERLACE	PLLX=203177	UNITSX=200177
←JZA	PLNF=203203	UNITS OFF=200150
LACE	PLNFENTRY=203145	UNITS OFF1=200156
LAST=203363	PLNXT=203174	UNITS OFF2=200157
←LDAB	PLOTIT	*ZZLAST=203572
		#
		B

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```
----------------------------------------------------------------
                 LMH   Y3HT   004
                                          =540500202423
ARCTAN=AJPQ   CACT

                                          =             7
BSFAC= 7
                                          =        200100
BADOV= 200100

                                          =301200101343
CSQ=RFD  *+1
                                          =        374000
CMSSCSZ= 374000
                                          =        200022
CMSTART= 200022
                                          =        200024
CMCEN= 200024
                                          =     100000000
CMMINRAD= 100..
                                          =             0
CMMINSTEP= 0
                                          =        200030
CMNAME= 200030
                                          =            32
CMa= 32
                                          =            33
CMB= 33
                                          =        177772
CMMASK= 177772

                                          =        100000
DISPLAY FILE= 100000
DISPLAYFILESIZE= 177000-DISPLAY FILE      =         77000

                                          =   1712377730
ERRORSTOP=SKM  4.10 377730

                                          =        200002
FRESH  START= 200002

                                          =   1712377724
INTERLACE=SKM  4.10 377724

                                          =            10
LACE= 10
                                          =        177777
LMINC= CMFAC

                                          =311037123103
PI= 311037..123103**PI/4
                                          =            70
PLS= 70
                                          =   1725203312
PLESW=SKM  1.5 PLSW
                                          =        177700
PLTABLE= 177700
                                          =   1727203312
PLCSW=SKM  1.7 PLSW
                                          =   1731203312
PLIPSW=SKM  1.9 PLSW
                                          =   1721203312
PLUSW=SKM  1.1 PLSW
                                          =   1712200132
PLPUBUSY= SKM  4.10 PLPUNCH JMP
                                          =   1726203312
PLLSW=SKM  1.6 PLSW
                                          =            64
PLU= 64
                                          =        203364
PLEADER={ 48.,51.,,73,0}
                                          =            73
PLP= 73
                                          =   1712200131
PLPLBUSY= SKM  4.10 PLPLOTJMP
                                          =   1722203312
PLPSW=SKM  1.2 PLSW
                                          =   1730203312
PLITSW=SKM  1.8 PLSW
                                          =            54
PLLK1= 100000/729.
                                          =           132
PLLK2= 100000/243.-PLLK1
                                          =           416
PLLK3= 100000/81.-(PLLK1+PLLK2)
                                          =          1451
PLLK4= 100000/27.-(PLLK1+PLLK2+PLLK3)
PLLK5= 100000/9.-(PLLK1+PLLK2+PLLK3+PLLK4)
                                          =          4573

PLLK6= 100000/3-(PLLK1+PLLK2+PLLK3+PLLK4+PLLK5)
                                          =         16163
```

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---------------------------------------------------------------

                    LMH   YSHT    005

PLCK1= PLLK1*PLCRATIO/10.                          =          26
PLCRATIO= 5                                        =           5
PLCK2= PLLK2*PLCRATIO/10.                          =          55
PLCK3= PLLK3*PLCRATIO/10.                          =         207
PLCK4= PLLK4*PLCRATIO/10.                          =         624
PLCK5= PLLK5*PLCRATIO/10.                          =        2275
PLCK6= PLLK6*PLCRATIO/10.                          =        7071
PLCAK1= 377777777777/8.                            = 37777777777
PLCAK2= 3*PLCAK1-PLCAK1                            = 77777777776
PLCAK3= 5*PLCAK1-(PLCAK1+PLCAK2)                   = 77777777776
PLCAK4= 7*PLCAK1-(PLCAK1+PLCAK2+PLCAK3)            = 77777777776
PLOTIT=SKM 4.10 PLCLEANJMP                         =  1712200130
PLTABLELENGTH= 200000-PL`TABLE                     =         100
PLLOWFILTER= 4                                     =           4
PBIK= 100.                                         =         144
PBIK4= 13.                                         =          15
PBIK5= 38.                                         =          46
PBIK6= 113.                                        =         161
PLFC= 377777777777                                 =377777777777
PLITK=( 10000.,,(176000.-30./20.) )                =      203365
PLPK= 40                                           =          40
PMAGPOINT= LMSTART                                 =      200022
PMAGNAME= LMNAME                                   =      200030

RINTERLACE=SKM 4.9 377724                          =  1711377724

S1a= 34                                            =          34
S1B= 35                                            =          35
S1x= 36                                            =          36
S17= 37                                            =          37
SQ60SEE= 200005                                    =      200005
STARTS= 200003                                     =      200003
SQRT=*JPQ   SQUARE ROOT BY HPP                     =540500202341
SCa= 43                                            =          43
SCB= 44                                            =          44
STOPIFFULL=SKM 4.10 377732                         =  1712377732

TWINKLE=SKM 4.9 377724                             =  1711377724
TRACK= PLENDJMP+1*                                 =      600134
TRBUSY=SKM 4.10 PLENDJMP+1                         =  1712200134
*T1= 1                                             =           1

a= S1a                                             =          34

B= S1B                                             =          35
```

```
----------------------------------------
                    LMH  Y3HT  008
-- DEF EXAMINE|0→B
'•IOS₀•
STE B
-- END

-- DEF NORMALIZE|P→C/S×F=R→Q
LDA P ** POINT P AT
SUB C ** CENTER C TO BE
SAB (-(F),) ** NORMALIZED TO 2^F ×S
•JOV Q ** AND IF OUT, GO TO
DIV S ** Q, AND LEAVE RESULT
•JOV Q-(S)+(S)        ** IN R
STA R
-- END

-- DEF MOVE|A→B
•LDE A
STE B
-- END

-- DEF ABVAL|P→Q
LDA P
'JPA #+2
'COM A
²'JPA #+2
²'COM A
STA Q
-- END

-- DEF DUALNORM|P→Q,R→S=T
LDA P
SUB Q
NOA (0)
STA B
²²STD B
LDA R
SUB S
NOA (0)
²²EXA B
³²SUB D
³²JPA #+3
²'SCB A
JPQ #+3
COM A
²SCB A
LDA B
STA T
-- END

-- DEF MDIF|P,Q→R
```

```
------------------------------------------

                LMH  Y3HT  007

LDA P
SUB Q
SCA {-1,-1,,-1,-1}+(Q^(770,))
STA R
**END

**DEF JZA|P
JPA *+3
JNA *+2
JPQ P
**END

**DEF NEARCR|P→Q,R→S=T
LDB {377777,,377777}
LDA P
SUB Q
NOA {0}
JPA *+2
21 COM B
LDA R
SUB S
NOA {0}
JPA *+2
1 COM B
STB T
**END

**DEF ORVAL|P→Q
LDA P
1 JPA *+2
1 COM A
21 JPA *+2
21 COM A
STA B
17 SUB A
21 JPA *+2
17 LDB B
LDA B
STA Q
**END

**DEF SCNORM|P→Q=R→S
T1=Q
NORMALIZE|P→SCCEN+T1/SCSZ=R→S
**END

**DEF DIFF*P→Q=R→S
LDA P
SUB Q
*JOV S
```

```
STA R
--END

--DEF FABVAL≡P→Q
LDA P
JPA *+2
COM A
STA Q
--END

--DEF *⊟A×B×C×D×E×F×G×H×I,*
REX_B*(0_a)
RSX_B*(LIST+I_B)+(IA(370,))
RSX_B*(LIST+H_B)+(HA(370,))
RSX_B*(LIST+G_B)+(GA(370,))
RSX_B*(LIST+F_B)+(FA(370,))
RSX_B*(LIST+E_B)+(EA(370,))
RSX_B*(LIST+D_B)+(DA(370,))
RSX_B*(LIST+C_B)+(CA(370,))
RSX_B*(LIST+B_B)+(BA(370,))
RSX_B*(LIST+A_B)+(AA(370,))
--END

--DEF PYTH≡P→Q=T→U
PYTH1≡P→Q, P+1→Q+1=T→U
--END

--DEF DIREC1≡P→Q,R→S=T→U
LDA R
SUB S
*JOV U-(S)+(S)
STA B+(R)-(R)
LDA P
SUB Q
*JOV U-(Q)+(Q)
*JPQ CACT
STA T
--END

--DEF DIREC≡P→Q=T→U
DIREC1≡P→Q,P+1→Q+1=T→U
--END

--DEF HSUM≡P,Q→R
LDA P
ADD Q
SCA {-1,-1,,-1,-1}+(QA(770,))
STA R
--END
```

```
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

                LMH   YJHT   011

▸▸DEF  SUMM≡P→Q=R→S

LDA P

ADD Q

•JOV S

STA R

▸▸END


▸▸DEF  PROD≡A×B/C=D→E

LDA A

MUL B

DIV C

•JOV E

STA D

▸▸END


▸▸DEF  LDAE≡A,B,C,D

LDA A

LDB A+B

LDC A+C

LDD A+D

▸▸END


▸▸DEF  STAE≡A,B,C,D

STA A

STB A+B

STC A+C

STD A+D

▸▸END


▸▸DEF  STAB≡P

STA P

STB P+1

▸▸END


▸▸DEF  PYTH1≡P→Q,R→S=T→U

LDA R

SUB S

•JOV U-(S)+(S)

STA B-(R)+(R)

LDA P

SUB Q

•JOV U-(Q)+(Q)

•JPQ PYTHAGORIAN

•JOV U

STA T

▸▸END


▸▸DEF  FULL≡ø→P

•JPQ {FULL1≡ø→P}

▸▸END
```

LMH Y3HT 012

```
←← DEF FULL1≡α→P
'STE #+2
SK Z STOPIFFULL
'#α
JP@ P
←← END

←← DEF LDAB≡A
LDA A
LDB A+1
←← END

←← DEF ERROR≡α→P
#JP@ (ERROR1≡α→P)
←← END

←← DEF ERROR1≡α→P
'STE #+2
SK Z ERRORSTOP
'#α
JP@ P
←← END
```

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```
-----------------------------------------------------------
              LMH  YJHT  013
       **IES PLOTTER SERVICE PROGRAM
       **LMH ON|OFF LINE PLOTTER
       **PLOT 518-4
 CMMASK|
       -0,400,,-0,400               |777400 777400|   772
CMOFFSET-
                                    |000000 000000|   773
        0
                                    |000000 000000|   774
CMPTO-  0
                                    |000000 000000|   775
CMPTI-  0
CMNAME1-
                                    |000000 000000|   776
        0
                                    |000000 000000|   777
CMFAC-  0
 200000|
CL-    JPQ  CLEAN   **NEW PICTURE   |140500 200140|200000
ST-    JPQ  SETUP   **SAME PICTURE  |140500 200142|   001
 200004|
I4-    JPQ  SQ60A   **START SCOPE HERE
                                    |140500 200200|   004

 200006|
       *JMP  SQUARE ROOT BY HPP     |400500 202341|   006
       *JMP  PYTHAGORIAN            |400500 202525|   007
       *JMP  CACT   **TO ARC TANGENT
                                    |400500 202423|200010

 200017|
       *JMP  PMAG   **POINTS        |400500 200375|   017
I20-   *JMP  LMAG   **TO MAGNIFY LINES
                                    |400500 201465|200020

       *JMP  CMAG   **TO MAGNIFY CIRCLES
                                    |400500 200430|   021

LMSTART-
                                    |000000 000000|   022
        0
                                    |000000 000000|   023
        0
LMEND-  0    **END OF LINE          |000000 000000|   024
        0    **OR CIRCLE CENTER     |000000 000000|   025
CMANG-  0    **ANDLE TO DRAW CIRCLE THRU
                                    |000000 000000|   026

CMRAD-  0    **RADIUS OF CIRCLE     |000000 000000|   027
                                    |000000 000000|200030
LMNAME- 0
NDISP-  0    **WHERE TO PUT NEW POINTS IN DISPLAY
                                    |000000 000000|   031

SNDISP- 0    **#OF POINTS IN DISPLAY
                                    |000000 000000|   032

 200034|
        1.   **SCSZ                 |001000 000000|   034
                                    |000000 000000|   035
SCCEN-  0
        0                           |000000 000000|   036

 200130|
PLCLEANJMP-
       *JMP  PLCLEAN      **CLEAN PLOTTER PROGRAM
                                    |400500 202622|200130
```

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----------------------------------------------------
                LMH   YJHT   014
PLPLOTJMP-
      *JMP   PLPLOT**PLOT DATA        |400500 202637|    131
PLPUNCHJMP-
      *JMP   PLPUNCH       **PUNCH DATA
                                      |400500 202634|    132
PLENDJMP-
      *JMP   PLEND **END OF DATA      |400500 202642|    133
      **PLENDJMP+1 = *JMP  TRACK
 PLENDJMP+2|
PLINTSTART-
                                      |400500 203045|    135
      *JMP   PLINTSTART2
PLOTBLOCKS-
      0      **TOTAL,,AMT TO GO       |000000 000000|    136
PLOTSTORAGE-
                                      |000000 000000|    137
      0      **,,TOTAL
 200140|
                                      |540500 200144|200140
CLEAN- *JPQ  UNITS
                                      |140500 200002|    141
      JPQ   FRESH START
                                      |540500 200144|    142
SETUP- *JPQ  UNITS
                                      |140500 200003|    143
      JPQ   STARTS
                                      |013000 200177|    144
UNITS- 1STE  UNITSX
                                      |021712 200130|    145
      MKZ   PLOTIT
      MOVEI(-0,400,,-0,400)-CMMASK
                                      |402000 203366|    146
      *LDE (-0,400,,-0,400)
                                      |003000 177772|    147
      STE   CMMASK
UNITS OFF-
                                      |301240 200151|200150
       CSQ40
                                      |001234 000036|    151
      REX 0 36
      MOVEI(1IOS 77 20000)-UNITS OFF1
                                      |402000 203367|    152
      *LDE (1IOS 77 20000)
                                      |003000 200156|    153
      STE   UNITS OFF1
      MOVEI(1IOS 77 40000)-UNITS OFF2
                                      |402000 203370|    154
      *LDE (1IOS 77 40000)
                                      |003000 200157|    155
      STE   UNITS OFF2
UNITS OFF1-
                                      |000000 000000|    156
       0
UNITS OFF2-
                                      |000000 000000|    157
       0
                                      |021135 200156|200160
      2RSX 8  UNITS OFF1
                                      |031235 000001|    161
      DEX 8 1
                                      |021635 200156|    162
      2DPX 8  UNITS OFF1
                                      |021635 200157|    163
      2DPX 8  UNITS OFF2
                                      |760634 200156|    164
      -1JPX 0  UNITS OFF1
CONFIGS-
      SPG ( 760,342,,340,0)           |002200 203371|    165
      4SPG ( 410,763,,762,761)        |042200 203372|    166
      10SPG ( 160,142,,140,411)       |102200 203373|    167
      14SPG ( 202,163,,162,161)       |142200 203374|200170
      20SPG ( 722,232,,230,200)       |202200 203375|    171
      24SPG ( 605,721,,720,722)       |242200 203376|    172
```

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            LMH   Y3HT   015
      30SPG ( 320,670,,750,600)     |302200 203377|    173
      34SPG ( 604,331,,330,335)     |342200 203400|    174
      REX 61  SCRAMBLE              |001261 200346|    175
      RXF 60  SQ60 A                |101260 200200|    176
UNITSX→JPQ *                        |140500 200177|    177
```

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                    LMH   Y3HT   001

SQ60A→   CSQ60
        'IOS 60 30010
        RSX SIa SNDISP
        SXG SIa 0
        JPQ  SINULL
        SXL SIa 50
        JPQ #+2
        JPQ  SQ60FEW
        SKN  INTERLACE
        JPQ  SQ60D   **DIRECT
SQ60I→  -'JPX SIa SQ60IA
        JPQ  SQ60SEE
SQ60IA→-'JPX SIB#+2
        REX SIB LACE-1
        SXL SIB LACE
        REX SIB LACE-1
        SKZ  RINTERLACE
        JPQ  SQ60IR
        DEX SIa|SIB
        JNX SIa SQ60IS-2
SQ60IB→SXL SIa 7×LACE
        JPQ  SQ60IS
SQ60IC→TSD SIa DISPLAY FILE
        DEX SIa LACE-1
        -'JPX SIa SQ60IC
        JPX SIB SQ60A
        JPQ  SQ60SEE
SQ60IS→TSD SIa DISPLAY FILE-(0×LACE)
        TSD SIa DISPLAY FILE-(1×LACE)
        TSD SIa DISPLAY FILE-(2×LACE)
        TSD SIa DISPLAY FILE-(3×LACE)
        TSD SIa DISPLAY FILE-(4×LACE)
        TSD SIa DISPLAY FILE-(5×LACE)
        TSD SIa DISPLAY FILE-(6×LACE)
        TSD SIa DISPLAY FILE-(7×LACE)
        DEX SIa 10×LACE
        SXL SIa 7×LACE
        JPQ  SQ60IS
        JNX SIa SQ60IS-2
        JPQ  SQ60IC
SQ60IR→DEX SIa 0    **RANDOM DECREASE
        RXF 61 SQ60IRR
        JPQ  SQ60IB
SQ60IRR→
        'IOS 61 30000
        'TSD  SCRAMX
        'LDE  SCRAMX
        'ITE ( LACE-1v(LACE-1/2)v(LACE-1/4)v(LACE-1/1
                              0)v(LACE-1/20) )
        RSX SCa E
```

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                LMH    Y3HT    002

        SXL  SCα  LACE
        JPQ   SQ60IRR+1
        SXD  SCα  0
        REX  SCα
        1DPX  SCα  SQ60IR
        JPD   SCRAMBLE
SQ60D→  1DPX  S1α  SQ60D3
        DEX  S1α  7
        1DPX  S1α  SQ60D2
        REX  S1α  0
SQ60D1→TSD  S1α  DISPLAY FILE
        TSD  S1α  DISPLAY FILE+1
        TSD  S1α  DISPLAY FILE+2
        TSD  S1α  DISPLAY FILE+3
        TSD  S1α  DISPLAY FILE+4
        TSD  S1α  DISPLAY FILE+5
        TSD  S1α  DISPLAY FILE+6
        TSD  S1α  DISPLAY FILE+7
        INX  S1α  10
SQ60D2→SXL  S1α#      **N-7
        JPQ   SQ60D3
        JPQ   SQ60D1
        TSD  S1α  DISPLAY FILE
        INX  S1α  1
SQ60D3→SXL  S1α#      **N
        JPQ   SQ60SEE
        JPQ   #-4
SQ60FEW→
        JPQ   SQ60FEWX
        TSD  S1α  DISPLAY FILE
        TSD  S1α  DISPLAY FILE
        TSD  S1α  DISPLAY FILE
        TSD  S1α  DISPLAY FILE
        TSD  S1α  DISPLAY FILE
        TSD  S1α  DISPLAY FILE
        TSD  S1α  DISPLAY FILE
        TSD  S1α  DISPLAY FILE
SQ60FEWX→
        -1JPX  S1α  SQ60FEW+1
        JPQ   SQ60SEE
S1NULL→REX  S1α  22
S1NULL1→
        MOVE|S1INK S1α→S1DISPLAY
        MOVE|S1INK+1 S1α→S1INC
        MOVE|S1INK+2 S1α→S1STEPS
        RSX  S1β  S1STEPS
        RSX  S1γ  S1INC
        RSX  S1x  S1INC2
        TSD   S1DISPLAY
        1ADX  S1γ  S1DISPLAY
```

```
                LMH   Y3HT   003
      2ADX SI2 SIDISPLAY
      -1JPX SI8*-3
      -3JPX SI0 SINULLI
      JPQ  SQ60A
SCRAMBLE→
      CSQ61
      1IOS 61 30000
      RSX SC0 SNDISP
      RSX SC8 SNDISP
      JPQ  SCRAMX
SCRAM→ -1JPX SC8 SCRAMER
      AUX SC8 SNDISP
      JPX SC8 SCRAMER
      JPD  SCRAMBLE
SCRAMER→
      SKN  TWINKLE
      JPD  SCRAMBLE
      *LDE SC8 DISPLAY FILE
      STE  SCRAMN
      *LDE SC0 DISPLAY FILE
      *STE SC8 DISPLAY FILE
      *LDE  SCRAMN
      STE SC0 DISPLAY FILE
SCRAMX→DEX SC8 0
      3TSD *-1
      -1JPX SC0 SCRAM
      JPD  SCRAMBLE
CMSCSZ→ 770..
SCSZ→    1.
PMAG→  1STE  PMAGEXIT
      MOVE|200034→SCSZ
      SCNORM|PMAGPOINT+1→ 1=PMAGY→PMAGEXIT
      NORMALIZE|PMAGPOINT→SCCEN/SCSZ→PMAGEXIT
      2LDA  PMAGY
      ITA  CMMASK
      ADD  PMAGNAME
      RSX CM0 NDISP
      INX CM0 10
      SXL CM0 DISPLAYFILE SIZE
      ERROR≡CM0→PMAGEXIT
      DPX CM0 NDISP
      REX CM8 7
      DEX CM0 1
      STA CM0 DISPLAY FILE
      -1JPX CM8*-2
PMAGEXIT→
      JPQ *
CMAG→  1STE  CMEXIT
      MOVE|CMNAME→CMNAME1
      LDA  200034
```

```
------------------------------------------

             LMH   Y3HT   004
        STA   SCSZ
        MUL  (CMSSCSZ..)
        STA   CMSCSZ
        PYTH≡CMCEN→CMSTART=CMRAD→BADOV
        ADD   CMSCSZ  **SCOPE SIZE FOR CIRCLES
        *JOV  BADOV  **CIRCLE IS TO BIG
CMAG1→  DIFF≡CMCEN→SCCEN=CMXRCEN→CMEXIT
        FABVAL→CMMRCEN      **IX CENTERI
        DIFF≡CMCEN+1→SCCEN+1=CMYRCEN→CMEXIT
        FABVAL→CMTS
        SUB   CMMRCEN
        JNA   *+3
        LDA   CMTS
        STA   CMMRCEN**MAX CENTER DIST
CMAG2→  LDA   CMMRCEN
        SUB   CMRAD   **MAXCEN-R>SCSZ?
        JNA   CMAG2A+1       **CIRCLE TOO SMALL
        STA   CMTS
        SUB   CMSCSZ
        JNA   CMAG2A
        JPQ   CMEXIT
CMAG2A→LDA   CMTS    **MAXCEN-R<-1.5 SCSZ
        LDB   CMMRCEN
        SCB  (-1.)
        ADD   B
        JOV   CMAG2B
        LDB   CMSCSZ
        SCB  (-1.)
        ADD   B
        JOV   CMEXIT
        ADD   CMSCSZ
        JOV   CMEXIT
        JNA   CMEXIT
CMAG2B→LDA   CMMRCEN
        ADD   CMRAD
        JOV   CMAG3
        SUB   CMSCSZ
        JPA   CMAG3
        JPQ   CMALLON
CMAG3→  LDA  (CMMINRAD)    **IS RAD TINY?
        MUL   SCSZ
        SUB   CMRAD
        JPA   CMDAD
        LDA   CMANG   **IS ANGLE TINY?
        JPA   *+4
        JNA   *+2
        JPQ   CMDAD
        COM   A
        STA   CMSTOPA
        MUL   CMRAD   **ARCLENGTH/2TH
```

```
----------------------------------------
            LMH   YSHT   005
      STA   CMTS
      LDA  ( CMMINSTEP )
      MUL   SCSZ
      SUB   CMTS
      JPA   CMDAD
CMGNL→ REX  CMθ  0     **FIND EDGE POINTS
      LDA   CMXRCEN
      SUB   CMSCSZ  **DIST TO RT EDGE
      JOV   *+3
      REX  CMθ  0
      *JPQ   CMGNL1
      LDA   CMYRCEN
      SUB   CMSCSZ  **DIST TO TOP
      JOV   *+3
      REX  CMθ  2
      *JPQ   CMGNL1
      LDA   CMXRCEN
      ADD   CMSCSZ  **DIST TO LEFT EDGE
      JOV   *+3
      REX  CMθ  1
      *JPQ   CMGNL1
      LDA   CMYRCEN
      ADD   CMSCSZ  **DIST TO BOT
      JOV   *+3
      REX  CMθ  3
      *JPQ   CMGNL1
      JPQ   CMGNL2
CMGNL1→ 1STE   CMGNL1EX
      STA   CMTW    **CEN IN OR OUT?
      FABVAL→  B
      SUB   CMRAD    **(X-R)*(X+R)
      JPA   CMGNL1EX
      JNA   *+3
      DPX   CMTS
      JPQ   CMGNL1A
      EXA   B
      ADD   CMRAD
      SCA  (-1,)
      MUL   B
      SAB  ( 1,)
       SQRT
      STA   CMTS    **OFFSET
      DPX  CMθ  CMTU
CMGNL1A→
      LDB   CMYRCEN
      SKZ  1,2  CMTU
      LDB   CMXRCEN
      ADD   B
CMGNL1B→
      JOV   CMGNL1D
```

```
------------------------------------------------------------
                    LMH  Y3HT  006
        STA   CMTT     **VARIABLE PART
        FABVAL
        SUB   CMSCSZ
        JPA   CMGNLID
        LDA   CMTT
        1$LDB   A
        SCB  (-9.,)
        DIV   SCSZ
        *JOV   BADOV **SCSZ CHANGED
        STA   CMTT
CMGNLIBA←
        LDA   CMTS     **FIND IF ENT OR EXIT
        'DPX   CMTT
        LDB   CMANG
        SKZ  4.9 B
        COM   A
        SKZ  1.2 CMTU
        COM   A
        SKZ  1.1 CMTU
        COM   A
        JPA   CMGNLIBB
        MKN  1.1 CMTT** ITS AN EXIT
        JNA   CMGNLIBB
        MKN  1.3 CMTU
        MOVEICMTT←CMTV
        JPQ   CMGNLICA
CMGNLIBB←
        SZN  1.3 CMTU**FIRST OR SECOND PASS?
        JPQ   CMGNLIC
        LDA   CMTT
        STA   CMTV     **FIRST NUM
        JPQ   CMGNLID
CMGNLIC←
        MKN  1.4 CMTU**GOT 2
        LDA   CMTV
        21SUB   CMTT
        21JPA   CMGNLIE
        21JNA   CMGNLIE
        MKZ  1.4 CMTU** TWO ARE SAME. DELETE ONE
        MKN  1.1 CMTV**MARK AS EXIT
CMGNLICA←
        LDA   CMTW     **CENTER-SCOPE EDGE
        SKZ  1.1 CMTU
        COM   A
        JNA   CMGNLIEX        **CENTER WAS INSIDE
CMGNLIE←
        LDA   CMTT
        LDB   CMTV
        'LDA  ( CMSSCSZ)
        SKZ  1.1 CMTU
```

```
--------------------------------------------

              LMH   Y3HT   007
      1COM   A
      1LDB   A
      SKZ 1.2 CMTU
      JPQ  #+3
      17LDA   A
      17LDB   B
      STB  CM@  CMEDGES
      STA  CM@  CMEDGES+1
      LDA   CMTT
      1STA  CM@  CMDIRS+1
      LDB   CMTV
      1STB  CM@  CMDIRS
      SKZ 1.4 CMTU
      INX  CM@  1
      SKZ 1.3 CMTU
      INX  CM@  1
CMGNL1EX→
      JPQ  #
CMGNL1D→
      LDA   CMTS
      JNA  #+2
      JPQ   CMGNL1E
      COM   A
      STA   CMTS
      JPQ   CMGNL1A
CMGNL2→SXG  CM@  0       **CM@=EDGE PTS
      JPQ   CMALLON
      LDA   CMSTART** IS START ON
      SUB   SCCEN
      JOV   CMGNL3
      STA   CMTS
      FABVAL
      SUB   CMSCSZ
      JPA   CMGNL3
      LDA   CMSTART+1
      SUB   SCCEN+1
      JOV   CMGNL3
      STA   CMTT
      FABVAL
      SUB   CMSCSZ
CMGNL2A→
      JPA   CMGNL3
      LDA   CMTS
      16LDB   A
      SCB  (-9.,)
      DIV   SCSZ
      STA  CM@  CMEDGES
      12LDA   A
      MUL   SCSZ
      SAB  ( 18.,)
```

```
-----------------------------------------

            LMH   Y3HT   010

      STA   CMTS
      LDA   CMTT
      16LDB   A
      SCB  (-9.,)
      DIV   SCSZ
      22STA  CMa  CMEDGES
      12LDA   A
      MUL   SCSZ
      SAB  ( 10.,)
      STA   CMTT
      INX  CMB  1
      DIREC1≡CMTS→CMXRCEN ,CMTT→CMYRCEN=CMANGLESCMa→
                                  BADOV
      DPX  0|CMa  CMDIRS
      INX  CMa  1
      JPQ   CMGNL3A
CMGNL3→DIREC≡CMSTART→CMCEN =CMSTA→BADOV
CMGNL3A→
      STA   CMSTA
      DPX  CMa  CMNUMI
CMGNL4→RSX  CMa  CMNUMI
      JPQ   CMGNL4X
CMGNL4A→
      REX  CMB|CMa
      JPQ   CMGNL4AX
CMGNL4B→
      LDA  CMB  CMEDGES
      20SUB  CMa  CMEDGES
      20JPA   CMGNL4AX
      20JNA   CMGNL4AX
      MKN  2.1|CMa  CMDIRS
      8LDE  CMa  CMDIRS
      3SED  CMB  CMDIRS
      JPQ   CMGNL4AX
      MKN  2.1|CMB  CMDIRS
CMGNL4AX→
      -1JPX  CMB  CMGNL4B
CMGNL4X→
      -1JPX  CMa  CMGNL4A
CMGNL4C→
      REX  CMa  0
      REX  CMB  0
CMGNL4D→
      SXL  CMa*CMNUMI
      JPQ   CMGNL4E
      LDA   CMEDGESCMa
      LDB  CMa  CMDIRS
      STA  CMB  CMEDGES
      STB  CMB  CMDIRS
      INX  CMa  1
```

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```
----------------------------------------------------------
              LMH   YSHT   011
     SKN 2.1 B
     INX CM8 1     **ONLY IF NOT REJECT
     JPQ  CMGNL4D
CMGNL4E→
     DPX CM8 CMNUMI
     -1JPX CM8*+2
     JPQ  CMEXIT
CMGNL5→12LDA CM8 CMEDGES  **COMPUTE ANGLES
     MUL  SCSZ
     SAB ( 18.,)
     STA  CMTS
     11LDA CM8 CMEDGES
     MUL  SCSZ
     SAB ( 18.,)
     STA  CMTT
     DIREC1≡CMTS→CMXRCEN,CMTT→CMYRCEN→BADOV
     SUB  CMSTA
     LDB  CMANG
     SKZ 4.9 B
     COM  A
     JPA *+3
     JNA *+2
     DPX  A
     DPX  B
     CAB (-1,)
     STA CM8 CMANGLES
     -1JPX CM8 CMGNL5
CMGNL6→REX CM8 0
CMGNL6A→
     *JPQ  CMGNL6S
     SKN 4.9 CMTT
     JPQ  CMDRAW
     *JPQ  CMGNL6R        **REMOVE ENTRY
     SKZ 1.1 C
     JPQ  CMGNL6A** IT WAS AN EXIT
     STA  CMTU      **START ANGLE
     STB CM8 CMDRAWS
     INX CM8 1
     *JPQ  CMGNL6S
     SKZ 4.9 CMTT
     JPQ *+3
     LDA  CMSTOPA
     JPQ *+4
     RSX CM0 CMTT
     SKZ 1.1|CM0 CMDIRS
     *JPQ  CMGNL6R
     SUB  CMTU
     *JNA  BADOV **ANGLES NOT IN ORDER
     JPA *+2
     DPX  A
```

```
------------------------------------------
            LMH   Y3HT   012
      STA  CMB CMDRAWA-1
      JPQ   CMGNL#A
CMGNL#R→
      'STE   CMGNL#RX
      RSX  CMa  CMTT
      EXX  CMB  CMNUMI
      .DEX  CMB  1
      LDA  CMB  CMEDGES
      EXA  CMa  CMEDGES
      STA   B
      LDA  CMB  CMDIRS
      EXA  CMa  CMDIRS
      STA   C
      LDA  CMB  CMANGLES
      EXA  CMa  CMANGLES
      EXX  CMB  CMNUMI
CMGNL#RX→
      JPQ  #
CMGNL#S→
      'STE   CMGNL#SE
      LDA   CMSTOPA
      STA   CMTS
      DPX   CMTT
      RSX  CMa  CMNUMI
      JPQ   CMGNL#X
CMGNL#SA→
      LDA  CMa  CMANGLES
      SUB   CMTS
      JPA   CMGNL#X
      JNA   CMGNL#SB
      *JPQ   BADOV  **ANGLES ARE SAME
CMGNL#SB→
      ADD   CMTS    **BETTER
      STA   CMTS
      'DPX  CMa  CMTT
      MKN  4,9  CMTT
CMGNL#X→
      -'JPX  CMa  CMGNL#SA
CMGNL#SE→
      JPQ  #
CMALLON→
      SCNORM|CMSTART=CMDRAWS→CMEXIT
      SCNORM|CMSTART+1→1=22 CMDRAWS→CMEXIT
      LDA   CMANG
      JPA  #+5
      JNA  #+3
      DPX   A
      JPQ  #+2
      COM   A
      STA   CMDRAWA
```

```
-----------------------------------------

            LMH   Y3HT   013

      REX CM8 1
CMDRAW→NORMALIZEICMRAD/SCSZ×BSFAC=CMRAD→CMDAL
      NORMALIZEICMCEN→SCCEN/SCSZ×BSFAC=CMMID→BADOV
      NORMALIZEICMCEN+1→SCCEN+1/SCSZ×BSFAC=22 CMMID
                    →BADOV
      SXG CM8 0
      JPO  CMEXIT **DONE
      DPX CM8 CMNUMS
      LDA {-4,,4}
      LDB {-0,,0}
      MOVEICMRAD→22 CMRAD
      20DIV  CMRAD
CMDRAW1→
      LDB  CMANG
      SKZ 4,9 B
      COM  A
      STA  CMFAC
      20MUL  CMMID
      20SAB { BSFAC,0,,BSFAC,0}
      17STA  CMOFFSET
      DPX  CMNUMDONE
CMDRAW2→
      RSX CM0 CMNUMDONE   **HERE ON SEVERAL
      SXL CM0*CMNUMS      **TIMES
CMEXIT→JPO # **DONE
      LDA CM0 CMDRAWA
      INX CM0 1
      DPX CM0 CMNUMDONE
CMDRAW3→
      MUL { PI}
      11MUL  CMRAD** STEPS=REVS×PI/4×8×RAD
      1SAB { BSFAC-5×1000 }
      2DPX  A
      STA  CMSTEPS
CMDRAW4→
      LDA CM0 CMDRAWS-1
      STA  CMPTO
      17MUL  CMFAC**Y,,X
      17ADD  CMOFFSET
      20SCA {-1,0,,-1,0}
      17ADD  CMPTO
      STA  CMPT1
PLIESCIRCLE→
      SKN  PLOTIT
      JPO  CMSETUP
      NORMALIZEICMCEN→SCCEN/SCSZ=PLIESTS
      NORMALIZEICMCEN+1→SCCEN+1/SCSZ=22 PLIESTS
      LDB  PLIESTS
      LDA CM0 CMDRAWS-1
      LDC CM0 CMDRAWA-1
```

```
-------------------------------------------------
                LMH   YIHT   014
        LDD   CMANG
        SKZ  4.9  D
        COM   C
        *JPQ   PLOTCIRCLE
        JPQ   CMDRAW2
CMSETUP→
        RSX  CM0  CMSTEPS
        AUX  CM0  NDISP
        SXL  CM0  DISPLAYFILESIZE
        FULL≡CM0→CMEXIT
        INX  CM0  DISPLAY FILE
        'DPX CM0  CMLOOP1
        RSX  CM0  CMSTEPS
        'REX CM0|CM0
CMLOOP→LDA   CMPT1   **Y,X
        20MUL   CMFAC
CMLOOPS→
        20ADD   CMOFFSET      **ΔY,,ΔX
        20ADD   CMPTO**X,Y
        17EXA   CMPT1
        EXA   CMPTO
        ITA   CMMASK
        ADD   CMNAME1
CMLOOP1→
        STA  CM0  0
        LDA   CMPT1   **Y,X
        20MUL   CMFAC
        +1JNX  CM0  CMLOOPS
        RSX  CM0  NDISP
        AUX  CM0  CMSTEPS
        INX  CM0  1
        DPX  CM0  NDISP
        JPQ   CMDRAW2
CMDAD→  NORMALIZE|CMSTART→SCCEN/SCSZ=CMTS→CMEXIT
        NORMALIZE|CMSTART+1→SCCEN+1/SCSZ=22 CMTS→CMEX
                                  IT
        RSX  CM0  NDISP
        INX  CM0  1
        SXL  CM0  DISPLAYFILESIZE
        FULL≡CM0→CMEXIT
        LDC   CMNAME
        LDB  (-0,400,,-0,400)
        INS   C
        STC  CM0  DISPLAY FILE-1
        DPX  CM0  NDISP
        JPQ   CMEXIT
CMDRAWS→
        0
        0
        0
```

```
        o
        o
CMDRAWA-
        o
        o
        o
        o
        o
CMDIRS- o
        o
        o
        o
        o
        o
        o
        o
        o
CMEDGES-
        o
        o
        o
        o
        o
        o
        o
        o
        o
CMANGLES-
        o
        o
        o
        o
        o
        o
        o
        o
        o
LMAG-   1STE   LMAGEXIT
        LDA    200034
        STA    SCSZ
        HDIFILMEND,LMSTART-LMDX
        HDIFILMEND+1,LMSTART+1-LMDY
        MUL    LMDX
        NAB    (o)
        JPA    LMAG3
        JNA    LMAG2
LMAG1-  LDA    LMDX
        JPA    LMAG1E
        JNA    LMAG1E
        LDA    LMDY
```

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```
--------------------------------------------------------------
                 LMH   Y3HT   018
      JPA   LMAG1A
      JNA   LMAG1A
      SCNORM|LMSTART=LMSST→LMAGEXIT
      SCNORM|LMSTART+1→1=22 LMSST→LMAGEXIT
      SKN   PLOTIT
      JPQ   #+5
      LDA   LMSST
      LDB   LMSST
      *JPQ   PLOTLINE
      JPQ   LMAGEXIT
      RSX  CM@  NDISP
      INX  CM@  1
      SXL  CM@  DISPLAYFILESIZE
      FULL≡CM@→LMAGEXIT
      LDA   LMSST
      LDB  {-0,400,,-0,400}
      LDC   LMNAME
      INS   C
      STC  CM@  DISPLAY FILE-1
      DPX  CM@  NDISP
      JPQ   LMAGEXIT
  LMAG1A→SCNORM|LMSTART=LMSST→LMAGEXIT
      STA   LMSEND
      SCNORM|LMSTART+1→1=22 LMSST→LMAG1B
      SCNORM|LMEND+1→1=22 LMSEND→LMAG1C
      JPQ   LMDRAW
  LMAG1B→SCNORM|LMEND+1→1=22 LMSEND→LMAG1N       **ST OF
                                F
      LDA   LMDY    **END ON START OFF
      LDB  { 377777}
      JNA  #+2
      COM   B
      'STB   LMSST
      JPQ   LMDRAW
  LMAG1C→LDA   LMDY    **ST ON END OFF
      LDB  { 377777}
      JPA  #+2
      COM   B
      'STB   LMSEND
      JPQ   LMDRAW
 LMAG1N→HDIF|SCCEN+1,LMSTART+1→LMTS        **BOTH OFF
      HDIF|SCCEN+1,LMEND+1
      MUL   LMTS
      JPA   LMAGEXIT
      LDB  { 377777}
      LDA   LMDY
      JPA  #+2
      COM   B
      'STB   LMSEND
      COM   B
```

```
----------------------------------------
              LMH   YJHT   017
      'STB  LMSST
      JPQ   LMDRAW
LMAG1E-SCNORM|LMSTART+1-1=²² LMSST-LMAGEXIT
      ²²STA  LMSEND
      SCNORM|LMSTART=²¹ LMSST-LMAGIF
      SCNORM|LMEND=²¹ LMSEND-LMAG1G
      JPQ   LMDRAW
LMAGIF-SCNORM|LMEND=²¹ LMSEND-LMAG1P
      LDA   LMDX     ** ST OFF END ON
      LDB   ( 377777)
      JNA   *+2
      'COM  B
      ²STB  LMSST
      JPQ   LMDRAW
LMAG1G-LDA  LMDX     ** ST ON END OFF
      LDB   ( 377777)
      JPA   *+2
      COM   B
      ²STB  LMSEND
      JPQ   LMDRAW
LMAG1P-HDIFISCCEN,LMSTART-LMTS
      HDIFISCCEN,LMEND
      MUL   LMTS
      JPA   LMAGEXIT
      LDB   ( 377777)
      LDA   LMDX
      JPA   *+2
      COM   B
      ²STB  LMSEND
      COM   B
      ²STB  LMSST
      JPQ   LMDRAW
LMAG2- HDIFILMDY,LMDX-LMDENOM
      MOVEI( 400000)-LMTT
      JPQ   LMAG4
LMAG3- LDA  LMDY
      ADD   LMDX
      SCA   (-1,)
      STA   LMDENOM
      MOVEI(-400000)-LMTT
LMAG4- HDIFILMSTART+1,SCCEN+1    ** XΔY-YΔX
      MUL   LMDX     ** /ΔY+ΔX
      DIV   LMDENOM
      STA   LMTS     ** YΔX
      HDIFILMSTART,SCCEN
      MUL   LMDY
      DIV   LMDENOM
      NORMALIZE-LMTS/SCSZ=LMSKEY-LMAGEXIT
      MUL   LMTT
      'STA  LMSKEY
```

```
-------------------------------------------------------------
              LMH   YSHT   020
LMAGS-  SCNORM|LMSTART=LMSST-LMAGSA
        SCNORM|LMSTART+1-1=22 LMSST-LMAGSA
        SCNORM|LMEND=LMSEND-LMAGSB
        SCNORM|LMEND+1-1=22 LMSEND-LMAGSB
        JPQ   LMDRAW  **BOTH ON
LMAGSA- SCNORM|LMEND=LMSEND-LMAGSC
        SCNORM|LMEND+1-1=22 LMSEND-LMAGSC
        **END ON, START OFF
        *JPQ   LMSLR
        NEARCR|LMSTART-LMEND,LMSTART+1-LMEND+1= A
        *JPQ   LMKEY
        STA   LMSST
        JPQ   LMDRAW
LMAGSB- *JPQ   LMSLR
LMAGSCA-
        NEARCR|LMEND-LMSTART,LMEND+1-LMSTART+1= A
        *JPQ   LMKEY
        STA   LMSEND
        JPQ   LMDRAW
LMAGSC- HDIF|LMSTART,SCCEN-LMXSR
        HDIF|LMSTART+1,SCCEN+1-LMYSR
        HDIF|LMEND,SCCEN-LMEXR
        HDIF|LMEND+1,SCCEN+1-LMEYR
        SKZ  4.9  LMTT
        JPQ   LMAGSCB
        LDA   LMXSR
        SUB   LMYSR
        SCA  (-1,)
        STA   LMTS
        LDA   LMEXR
        SUB   LMEYR
        JPQ   LMAGSCC
LMAGSCB-
        LDA   LMXSR
        ADD   LMYSR
        SCA  (-1,)
        STA   LMTS
        LDA   LMEXR
        ADD   LMEYR
LMAGSCC-
        SCA  (-1,)
        MUL   LMTS
        NAB  ( 0)
        JNA  *+2
        JPQ   LMAGEXIT
        *JPQ   LMSLR
        NEARCR|LMSTART-LMEND,LMSTART+1-LMEND+1= A
        *JPQ   LMKEY
        STA   LMSST
        JPQ   LMAGSCA
```

```
             LMH   Y3HT   021
       **LINE SLOPE SUBROUTINE
LMSLR→ 1STE  LMSLRX
       DUALNORM(LMSTART→LMEND,LMSTART+1→LMEND+1=LMSL

LMSLRX→JPQ  *
       **SUBROUTINE TO FIND AN EDGE POINT
LMKEY→ 1STE  LMKEYEX
       STA  LMKCR  **IN, A POINT IN LMSKEY
       20SUB  LMSKEY      **SLOPE IN LMSL
       20SAB  (-1,0,,-1,0) **1/2 CORNER DIST
       17MUL  LMSL
       20DIV  LMSL **OFFSETS ΔY,,ΔX
       STA  B
       20JOV  LMKEY1
       17ADD  LMSKEY
       20JOV  LMKEY2
       20ADD  B
       21JOV  LMKEYT+3
       2LDA  LMKCR
       17LDA  A    **USE SIDE ENTRY
LMKEYEX→
       JPQ  *
LMKEY1→1JOV *+2
       JPQ  LMKEYT
       ¬21JOV  BADOV
       JPQ  LMKEYS
LMKEY2→1JOV  LMKEYS+1
       JPQ  LMKEYT+2
LMKEYS→17ADD  LMSKEY      **MUST USE SIDE
       ¬21JOV  BADOV      **ENTRY
       20ADD  B
       ¬21JOV  BADOV
       JPQ  LMKEYEX-2
LMKEYT→17ADD  LMSKEY      **MUST USE
       ¬1JOV  BADOV**TOP OR BOTTOM
       20ADD  B     **ENTRY
       ¬1JOV  BADOV
       22LDA  LMKCR
       JPQ  LMKEYEX-1
LMDRAW→SKN  PLOTIT
       JPQ  LMDRAW1
       LDA  LMSST
       LDB  LMSEND
       *JPQ  PLOTLINE
       JPQ  LMAGEXIT
LMDRAW1→
       LDA  LMSEND
       20SUB  LMSST
       20SCA  (-2,-2,)
       STA  LMSL
```

```
                LMH   Y3HT   022
      20MUL   A
      2EXA   B
      ADD   B
      16LDB   A
      SCB  (-9.,)
      *JPQ   SQRT
      STA   LMTS
      22STA   LMTS **1/4 LENGTH
      20SCA  (-6,-6)
      21MUL  ( 377600,,0)
      22STA   LMCNT**N-1 SPOTS
LMDRAW1A→
      LDA   LMSL
      LDB   LMSL
      20SCB  (-18.,-18.,)
      20DIV   LMTS
      20SAB  (-9.,-9.,)
      1JPA  *+3        **ROUND
      1JNA  *+5
      JPQ  *+6
      SKZ  2.9  B
      1ADD  ( 1)
      JPQ  *+3
      SKN  2.9  B
      1SUB  ( 1)
      21JPA  *+3
      21JNA  *+5
      JPQ  *+6
      SKZ  4.9  B
      22ADD  ( 1)
      JPQ  *+3
      SKN  4.9  B
LMDRAW1B→
      22SUB  ( 1)
      STA   LMINC   **INCREMENTS
      RSX  CMα  NDISP
      AUX  CMα  LMCNT
      INX  CMα  1
      SXL  CMα  DISPLAYFILESIZE
      FULL≡CMα→LMAGEXIT
      DPX  CMα  LMTS
      INX  CMα  DISPLAY FILE-1
      1DPX  CMα  LMDRAWLOOP
      RSX  CMα  LMCNT
      1REX  CMα|CMα
      LDA   LMSST
      LDB  (-377,,-377)
      MOVE|LMNAME→CMNAME|
      LDC   CMNAME|
      INS   C
```

```
--------------------------------------------------

                    LMH   Y3HT   023

LMDRAWLOOP→
          STC  CM• 0
          20ADD  LMINC
          +1JNX  CM• LMDRAWLOOP-2
          MOVEILMTS→NDISP
LMAGEXIT→
          JPQ  #
SQUARE ROOT BY HPP→
          1STE #+56** IN EXIT                202341
          LDD  {-0}
202343 →  AOP   66000**NAB
   344 →  STO  #+61-3**EXPONENT              202422
          MKZ  3.2 #+53-4                    202414
          JPA  #+12-5**N>0
          MKN  3.2 #+53-6**N≤0
          COM  A
          JPA  #+2**N<0
          JPQ  #+55-11**N=0
202353:   STA  #+57-12**IN N         202420
          SCA  {-3,}
          SUB  { 19461699408.}**N/8--.56641
          MUL  #+57-15** ×N
       →  SKN MKN CYR 4.1 #+61-16**HALVE EXPONENT   ←
          JPQ  #+24-17**IF EXP ODD  ─┐
       →  MUL  {-26413202830.}** - .7689  ↓
          SCA  { 1.}
          ADD  { 11003706211.}***+.32025
          JPQ  #+30-23** TO ITERATION
       →  MUL  {-18703036386.}**- .54433
          ADD  { 38905531 74.}***+.11323
          SCA  { 1.}
          MKZ CYR 1.1 #+57-27**HALVE N   202420
          **THE APPROX CAME FROM ROLLO SILVER
          **NOW WE DO NEUTON'S METHOD TWICE
          STA  #+60-30**APPROX(X1)  TO 9 BITS
          LDA  #+57-31
          DIV  #+60-32** N/X1
          AOP   67000**ADD D
        ┌ JOV  #+4
        │ SKN CYR 4.9  A** X1 WAS ≤N
        │ COM   A** NEW X1 ≥1                 0374
        │ SKU MKZ 4.9  A
202401  └ SCA  {-1.}**2X1→X1
          STA  #+60-41** X1 TO 18 BITS
          LDA  #+57-42
          DIV  #+60-43** N/X1
          AOP   67000
          JOV  #+4
          SKN CYR 4.9  A
          COM   A
```

```
            LMH   YSHT   024
      SKU MKZ 4.9  A
      SAB (-1.)**ROOT TO 36 BITS IN A
      SAB *+61-32** PROPER EXPONENT  <-  202.4 22
      JPQ *+3
      COM  B**FALLS THRU IF N<0
      COM  A
      JPQ  0**EXIT
       0**N
       111**APPROX ( X1 )
       222**EXPONENT
      **END OF SQUARE ROOT SUBROUTINE 4AUG60 HPP
CACT-  'STE  ACTEX
      STA  ACTX
      STB  ACTY
      JPA  ACTP1
      JNA  ACTN1
      LDA  ACTY
      JNA  *+4
      JPA  *+5
      LDA  ( 0 )
      JPQ  ACTEX
      LDA  ( 600.)
      JPQ  ACTEX
      LDA  ( 200.)
      JPQ  ACTEX
ACTN1-  COM  A
      LDC  ( 400.)
      STC  ACTANG
      JPQ  *+2
ACTP1-  DPX  ACTANG
      EXA  B        **MAG OF X IN B
      JPA  ACTP2
      JNA  ACTN2
      LDA  ACTANG
      JPQ  ACTEX
ACTN2-  COM  A
ACTP2-  SUB  B
      JPA  ACTP3   **Y BIGGER
      JNA  ACTN3   **X BIGGER
      LDA  ( 100.)
      SKZ  4.9  ACTY
      COM  A
      SKZ  4.9  ACTX
      COM  A
      ADD  ACTANG
      JPQ  ACTEX
ACTP3-  LDA  ACTY
      JPA  *+3
      LDC  ( 600.)
      JPQ  *+2
```

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```
                LMH  Y3HT  025
        LDC ( 200.)
        STC  ACTANG
        COM  A
        EXA  ACTX
        STA  ACTY
ACTN3-  LDA  ACTY
        16LDB  A
        SCB (-9.,)
        DIV  ACTX
        *JOV  BADOV
ACTEQ-  STA  ACTTT
        MUL ( 1087781232 6.)          **.3165880057113492.

        STA  ACTSUM
        LDA  ACTTT
        MUL  ACTTT
        MUL  ACTTT
        STA  ACTTS
        MUL (-3154853433.) **-.0918183194549342.
        ADD  ACTSUM
        STA  ACTSUM
        LDA  ACTTS
        MUL  ACTTT
        MUL  ACTTT
        MUL ( 866975697.)  **.0252323137487638.
        ADD  ACTSUM
        ADD  ACTANG
ACTEX-  JPQ  0
PYTHAGORIAN-
        1STE  PYTHAGORIANEX
        STB  PYTS
        MUL  A
        NAB ( 0)
        STD  PYTT     **1ST NORM
        EXA  PYTS     **1ST NUM
        MUL  A
        NAB ( 0)
        STD  PYTU     **2ND NORM
        STA  B        **2ND NUM
        LDA  PYTU
        32SUB  PYTT
        32JPA  PYTHAGORIAN3          **2ND NUM LARGER
        SCB  A
        LDA  PYTS
PYTHAGORIAN1-
        ADD  B
        JOV  PYTHAGORIAN4
        DPX  B
PYTHAGORIAN2-
        SKZ  4.9  A
```

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```
------------------------------------------
              LMH   Y3HT   026
      COM  B
      SAB  PYTT
       SQRT
PYTHAGORIANEX→
      JPQ  *
PYTHAGORIAN3→
      EXA  PYTS
      COM  PYTS
      SCA  PYTS
      LDC  PYTU
      STC  PYTT
      JPQ  PYTHAGORIAN1
PYTHAGORIAN4→
      EXA  PYTT
      32JNA  *+7
      EXA  PYTT    **RADIUS TO BIG
      LDB  { 0}
      SAB  {-2,}
       SQRT
      ADD  A
      JPQ  PYTHAGORIANEX
      EXA  PYTT
      LDB  {-0}
      JPQ  PYTHAGORIAN2
SIINK→  60,0,,60,0
       125,,-400
       140
       40,0,,40;0
       400,,400
       100
       40,0,,100,0
       0,,-400
       200
       0
       400
       200
      -40,-0,,100,0
       200,,-400
       200
      -40,-0,,0,0
       400
       200
      -100,-0,,100,0
      -400
       200
      **PLOTTER PROGRAM FOR SCOPE DRAWING
      **LINE  =START(A),END (B)
      **CIRCLE=START(A),CENTER(B),ANGLE(C)
      **USES PBI FOR CIRCLE MODE
      ** PLOTSVC 804-17
```

```
--------------------------------------------------------------
                LMH   Y3HT  -027
PLCLEAN-
        1STE  PLCLX
        SKX PLS PLTABLE-1
        DPX PLS PLPLSSAVE
        DPX  PLSW
        DPX  PLOTBLOCKS
        DPX  PLOTSTORAGE
        DPX  PLOTBLOCKS2
        MKZ  PLPUBUSY
        MKZ  PLPLBUSY
PLCLX-  JPQ  *
PLPUNCH-
        1STE  PLPUX
        RXF 63 PLPURTNE
PLPUX-  JPQ  *
PLPLOT- 1STE  PLPLX
        RXF 74 PLPLRTNE
PLPLX-  JPQ  *
PLEND-  1STE  PLLX
        SZN  PLESW
        JPQ  PLLX*
        LDA  ((56.--31.),0,,30000)
        STA PLS 1     ** IOS
        LDA  ( 377770,,)      **FINAL TSD
        STA PLS 0
        MKZ  PLCSW
        MKN  PLIPSW
        JPQ  PLEENTRY
        **PLOTTER PUNCH ROUTINE
        **SEQUENCE 63
PLPURTNE-
        MKN  PLUSW
        MKN  PLPUBUSY
        MKZ  PLLSW
        1IOS 63 30000          **NORMAL NO 7TH HOLE
PLPUL-  1SKX PLU 5
        3TSD  PLEADER          **0
        21JNX PLU*-1
        SZN  PLLSW
        JPQ  PLPUL2
        4TSD  PLEADER          **END MARK
        5TSD  PLEADER          **TALLY
        1SKX PLU 25.**BLKS OF LEADER
        DPX PLU PLUWA
        1IOS 63 30004          **NORMAL 7TH HOLE
        JPQ  PLPUL
PLPUL2- 3TSD  PLEADER          **0
        6TSD  PLEADER          **TALLY
        21ADX PLU PLUWA        **PLU CONTAINS 1
        1SED (-0)
```

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```
                LMH   Y3HT   030
        JPQ  *+2
        JPQ  PLPUL
        SKX  PLU PLTABLE-1
PLPUL3→MKN   PLPUBUSY
PLPUL4→SXD  PLU PLPLSSAVE*
        JPQ  PLUSTOP
        *LDE PLU 1    **IOS
        STE  PLUWA
        *LDE PLU 0    **TSD
        STE  PLUWA2
        1DPX PLU PLXSAVE    **SAVE CNTR
PLPUL5→1IOS 63 30004        **NORMAL. 7TH HOLE
        3TSD  PLUWA **IOS BITS
        *LDE  PLUWA2**TSD
        STE  PLUWA3
        SKX  PLU 5
        1IOS 63 30006       **SPLAYED. 7TH HOLE
        TSD  PLUWA3 **TSD + FILTER
        *-1 JPX PLU*-1
        1IOS 63 30000       **NORMAL. NO 7TH HOLE
        6TSD  PLUWA **TALLY
        11AUX PLU PLOTBLOCKS2      **PLU CONTAINS-1
        1DPX PLU PLOTBLOCKS2
        12AUX PLU PLOTBLOCKS
        1DPX PLU PLOTBLOCKS
        13RSX PLU PLUWA     **BLK CNTR
        *-1 JPX PLU PLPUL6
        11RSX PLU PLXSAVE  **RESTORE CNTR
        DEX  PLU 2
        JPQ  PLPUL4
PLPUL6→5DPX PLU PLUWA       **SAVE BLK CNTR
        JPQ  PLPUL5
PLUSTOP→
        SKZ  PLESW
        JPQ  PLUEND
        MKZ  PLPUBUSY
        JPD  PLPUL3
PLUEND→1SKX PLU 319.        **TAPE FEEDS
        1IOS 63 30000       **NORMAL NO 7TH HOLE
        3TSD  PLEADER       **0
        *1JNX PLU*-1
        *MKZ  PLPUBUSY
        *MKZ  PLUSW
        21IOS 63 20000
        JPD  *
PLOTBLOCKS2→
        0
        **PLOTTER PLOT ROUTINE
        **SEQUENCE 74
PLPLRTNE→
                PLTABLE-1
```

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```
            LMH   Y3HT    031
      MKN   PLPSW
PLPL1-  MKN   PLPLBUSY
PLPL2-  SXD PLP PLPLSSAVE*
      JPQ   PLPSTOP
      2DPX PLP PLXSAVE
      4LDE PLP 0    **TSD
      STE   PLPWA
      11RSX PLPIPLP 1        **IOS
      1DPX PLP PLPIOS
      MKZ 1.1 PLPL3
      SKZ 1.1 PLPIOS
      MKN 1.1 PLPL3
PLPL3-  21IOS 74 30000        **WAIT FOR PEN CHG
PLPIOS-1IOS 74 0     **MODIFIED
      SKZ 1.3 *-1    **PBIT
      JPQ   PLPPBI
      TSD   PLPWA
      SXL PLP 31000
      JPQ   PLREDFIL
PLPL4-  12RSX PLP PLXSAVE
      DEX PLP 2
      JPQ   PLPL2
PLREDFIL-
      DEX PLP 1100
      1DPX PLP PLPIOS
      JPQ   PLPIOS
PLPSTOP-
      SKZ   PLESW
      JPQ   PLPEND
      MKZ   PLPLBUSY
      JPD   PLPL1
PLPEND-*MKZ   PLPLBUSY
      *MKZ   PLPSW
      21IOS 74 20000       **DISC
      JPD *
PLPPBI-*TSD   PLPWA
      RFD 54 *+1
      **INTERVAL TIMER SEQUENCE. PBI MODE
      1DPX PLP PLPIT2
      12RSX PLP PLXSAVE   **TABLE CNTR
      15RSX PLPIPLP 1      **NO OF BLKS
      1IOS 54 30000       **STOP CNTR
      *1TSD   PLITK**1/20TH READER SPD
      1IOS 54 30300
      JPQ   PLPIT3
PLPIT-  SKN   TRBUSY
      RXF 57 TRACK
      31JNX PLP PLPIT
      13RSX PLP PLITWA    **BLKS LEFT
      *-1 JPX PLP PLPIT3
```

```
---------------------------------------------------------------------
                    LNH   Y3HT   032
        12RSX PLP PLXSAVE
        DEX PLP 2
        SKX 74 PLPL2
        SKZ 1.1 1PLP 1          **PEN UP NXT?
        JPQ  PLPLRF2
        MKZ 1.1 PLPIT2          **PEN  UP
        MKC 1.4 PLPIT2          **CHG  DIR
        MKZ 1.3 PLPIT2          **NO PBI
PLPIT2→1IOS 74 0      **MOD
        **INTERVAL  TIMER  SEQUENCE FOR MAIN PROGRAM
PLINTSTART2→
        1IOS 54 30000 .         **STOP  COUNTER
        a2TSD  PLITK**10.MS
        21IOS 54 30300          **CNT + DISMISS
        SKN  TRBUSY
        RXF 57 TRACK
        JPD  a-2
PLPIT3→a3DPX PLP PLITWA    **SAVE  BLK  CNTR
        14RSX PLP E **-19.
        JPD  PLPIT
PLITWA→..-19..
        **PLOTTER COMPUTATION ROUTINE
        **LINE MODE
PLOTLINE→
        1STE  PLLX
        MKZ  PLCSW
        1LDC ( PLFCK..PLFLK )
PLCENTRY→
        SKZ  PLESW  **TABLE FULL?
        JPQ  PLTF2
        1STC  PLSUBK
        3DPX  PLIOSBITS
        MKZ  PL1PSW **FIRST POINT
PL1→    20LDC  PLPP **CURRENT  LOCATION
        20STA  PLPP **NXT LOCATION
        5DPX  PLTLYK
        20ITA ( 777,770..777,770)
        20STA  PLWA
        SNN  PL1TSW
        JPQ  PLNF     **USE FILTER 0
        20LDA  PLPP
        20SUB  C        **=aX..aY
        a1JOV  PLOV1
PL1A→   a21JOV  PLOV2
        SKZ 2.9 A
        1COM  A
        SKZ 4.9 A
        21COM  A        **=ABS VAL aX..aY
        SKZ 1.6 PLIOSBITS **LINE MODE?
        JPQ  PL2A
```

```
------------------------------------------------------------
            LMH  Y3HT   033
       20STA   PLWA2
       20SUB ( PLPK..PLPK)
       SKZ  PL1PSW **1ST POINT OF PAIR
       JPQ  PL2
       20JPA   PLNF
       JPQ  PLNXT   **DO NOT PLOT
PL2-   1JPA *+2        **USE FILTER 0
       JPQ  PLNF
       21JPA *+2
       JPQ  PLNF
       20LDA   PLWA2
PL2A-  20SCA (-3.,-3.)       **USE 15 BITS ONLY
       2DPX PLS PLIOSBITS **SAVE COUNTER
       SKX PLS 0
PLSUBK-20SUB PLS PLFLK      **OR PLFCK
       20JPA   PLSUB
PLCONT-SKN 1.6 PLIOSBITS  **CIRCLE MODE?
       JPQ  PLCONT2
       SXL PLS PLLOWFILTER
       JPQ  PLCALCBLKS
       SKX PLS PLLOWFILTER
       JPQ  PLCALCBLKS
PLCONT2-
       1ADX PLS PLWA        **PUT FILTER IN TSD
       2ADX PLS PLWA
       3DPX PLS A   **PUT FILTER IN A
       4DPX PLS A
       3CYA ( 7.6) **PUT FILTER IN 1.9-17
       1ADD  PLIOSBITS
       12RSX PLS PLIOSBITS
PLNFENTRY-
       1STA PLS 1   **IOS
       ITA ( 77)
       LDD  PLTLYK
       TLY  A        **TALLY OF IOS
       TLY  PLWA   **TALLY OF TSD
       STA PLS 0    **TSD
       32COM   D
       21STD PLS 1 **TALLY +NO OF BLKS
PLEENTRY-
       2DPX PLS PLIOSBITS
       15RSX PLSIPLS 1     **NO OF BLOCKS
       INX PLS 1
       2ADX PLS PLOTBLOCKS        **TOTAL BLOCK COUNTE
                                  R
       SKX PLS 2
       1ADX PLS PLOTSTORAGE       **LENGTH OF STORAGE
                                  AREA
       12RSX PLS PLIOSBITS
       DEX PLS 2
```

```
------------------------------------------------------------

                LMH   Y3HT   034
        1DPX PLS PLPLSSAVE
        SXD PLS 67777
        FULL#PLS-PLTABLEFULL
        SKZ  PLUSW   **PUNCH?
        1IOS 63 50000        **RAISE FLAG
        SKZ  PLPSW   **PLOT?
        JPQ  PLPLRF
PLNXT-  SKZ  PLCSW   **CIRCLE?
        JPQ  PLC1
        SZN  PL1PSW
PLLX-   JPQ  *
PLCE2-  MKN 1.1 PLIOSBITS  **PEN DOWN
        LDA  B
        JPQ  PL1
PLNF-   1LDA  PLIOSBITS
        JPQ  PLNFENTRY
PLSUB-  INX PLS 1
        SXL PLS 6
        JPQ  PLCONT
        JPQ  PLSUBK
PLOV1-  2LDA ( PLFC)
        JPQ  PL1A
PLOV2-  21LDA ( PLFC)
        JPQ  PL1A+1
        **CIRCLE MODE
PLOTCIRCLE-
        1STE  PLCX
        MKN  PLCSW
        STC  PLCWA   **SAVE ANGLE
        2LDC ( PLFCK,,PLFLK )
        JPQ  PLCENTRY
PLC1-   SZN  PL1PSW
        JPQ  PLC2
        MKN 1.6 PLIOSBITS  **CIRCLE MODE
        MKN 1.3 PLIOSBITS  **PBI
        SKZ 4.9 PLCWA      **IS ANGLE POS?
        JPQ  PLCANGNEG
        MKN 1.4 PLIOSBITS  **CCW
        JPQ  PLCE2
PLCANGNEG-
        COM  PLCWA
        JPQ  PLCE2
PLCALCBLKS-
        MKZ 4.10#    **NO BLKS DONE
        LDA  PLCWA   **ARC
PLCB2-  3DPX PLS PLCWA2      **FILTER NO
        MUL PLS PBITABLE-PLLOWFILTER     **BLKS/CIRCLE

        DIV ( PLFC) **FULL CIRCLE. SAVE B
        JPA *+2      **<1 BLK
```

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LMH Y3HT 035

```
        JPQ   PLCB5
        16ADD (-1,) **SUB 1
        5STA  PLTLYK**NO OF BLKS
        MKN 4.10 PLCALCBLKS       **BLK DONE
        JPQ   PLCONT2
PLC2→   LDA   B
        JPA  *+2      **ANY REMINDER?
        JPQ   PLCB6B
        2DPX PLS PLIOSBITS **SAVE CNTR
        12RSX PLS PLCWA2    **FILTER
        SXL  PLS 6
        JPQ   PLCB6A
        LDA   PLWA     **TSO
        ITA  ( 777,770,,777,770)
        STA   PLWA
        15LDA  PLTLYK        **NO OF BLKS
        16SUB (-1,) **ADD 1
        MUL PLS PBITABLE2-PLLOWFILTER    **CIRCLES/BLK

        SAB  (-1,)
        LDA   PLCWA    **ARC REMAINING
        SUB   B        **AMOUNT DRAWN
        STA   PLCWA    **NEW ARC
PLCB4→  INX  PLS 1
        JPQ   PLCB2
PLCB5→  SXL  PLS 6
        JPQ   PLCB6
        LDA   PLCWA
        JPQ   PLCB4
PLCB6→  SNN 4.10 PLCALCBLKS       **ANY BLKS DONE?
        JPQ   PLCB7
PLCB6A→12RSX PLS PLIOSBITS        **RESET COUNTER
PLCB6B→MKZ   PLITSW
PLCX→   JPQ  * **EXIT
PLCB7→  DPX   B
        5DPX  PLTLYK
        JPQ   PLCONT2
PLTABLEFULL→
        MKN   PLESW    **SET TO END
PLTF2→  SKZ   PLCSW    **CIRCLE
        JPQ   PLCX*
        JPQ   PLLX*
PLSW→    0
PLUWA→   0
PLUWA2→  0
PLUWA3→  0
PLXSAVE→
         0
PLPWA→   0
PLWA→    0
```

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```
-----------------------------------------------------------
                LMH   Y3HT   036
PLWA2→   0
PLCWA2→  0
PLTLYK→-49 ..
PLPLSSAVE→
         0
PLIOSBITS→
        ..30000      **XPLS..30000
PLFLK→   PLLK1..PLLK1
         PLLK2..PLLK2
         PLLK3..PLLK3
         PLLK4..PLLK4
         PLLK5..PLLK5
         PLLK6..PLLK6
PLFCK→   PLCK1..PLCK1
         PLCK2..PLCK2
         PLCK3..PLCK3
         PLCK4..PLCK4
         PLCK5..PLCK5
         PLCK6..PLCK6
        **NO OF PBI BLOCKS PER CIRCLE
PBITABLE→
         PBIK4
         PBIK5
         PBIK6
PBITABLE2→
         PLFC/PBIK4
         PLFC/PBIK5
PLPP→    0      **PRESENT LOCATION
PLCWA→   0
PLCAK→   PLCAK1
         PLCAK2
         PLCAK3
         PLCAK4
PLPLRF→SKN   PLPLBUSY
        'IOS 74 50000
        JPQ  PLNXT
PLPLRF2→
        'IOS 74 50000
        JPQ  PLINTSTART2
PLLAST→  PLLAST-PLCLEAN+1
LAST→    ZZLAST
```